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NINTH ANNUAL REPORT

OF THE

SECRETARY

OF THE

Connecticut Board of Agriculture.

1875-'76

PRINTED BY ORDER OF THE LEGISLATURE.

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1876.

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General Assembly of the State of Connecticut:

In accordance with the provisions of the Act creating a STATE BOARD OF AGRICULTURE, I have the honor to present the Report for 1875–6.

T. S. GOLD, *Secretary.*

WEST CORNWALL, May 24, 1876.

STATE BOARD OF AGRICULTURE.

1875-6.

His Excellency CHARLES R. INGERSOLL, *ex officio*.

APPOINTED BY THE GOVERNOR AND SENATE.

		TERM EXPIRES
E. H. HYDE,	Stafford,	1876.
ALBERT DAY,	Brooklyn,	1877.
H. L. STEWART,	Middle Haddam,	1876.
J. T. ROCKWELL,	West Winsted,	1877.

ELECTED BY THE AGRICULTURAL SOCIETIES.

Hartford County,	S. M. Wells,	Wethersfield,	1876.
New Haven County,	W. H. Pond,	Milford,	1877.
New London County,	A. L. Avery,	Groton Bank,	1877.
Fairfield County,	E. H. Smith,	Ridgefield,	1876.
Windham County,	G. A. Penniman,	Woodstock,	1876.
Litchfield County,	Nathan Hart,	West Cornwall,	1876.
Middlesex County,	J. M. Hubbard,	Middletown,	1877.
Tolland County,	S. F. West,	Columbia,	1877.

ELECTED BY THE BOARD.

T. S. Gold, West Cornwall, *Secretary*.

OFFICIAL LIST.

Gov. Charles R. Ingersoll,		*President.*
E. H. Hyde,	Stafford,	*Vice-President.*
T. S. Gold,	West Cornwall,	*Secretary.*
Nathan Hart,	West Cornwall,	*Treasurer.*
Prof. S. I. Smith,	New Haven,	*Entomologist.*
Prof. W. H. Brewer,	New Haven,	*Botanist.*
Prof. S. W. Johnson,	New Haven,	*Chemist.*
P. M. Augur,	Middlefield,	*Pomologist.*

E. H. Hyde, T. S. Gold, H. L. Stewart,

Commissioners on Diseases of Domestic Animals.

H. L. Stewart, E. H. Hyde, J. T. Rockwell,

Auditors.

REPORT.

THE eighth annual meeting of the Connecticut Board of Agriculture was held at the United States Hotel in Hartford, May 26th, 1875, at 10 A. M. Hon. J. T. Rockwell, Chairman.

On motion of Mr. Stewart, it was

Resolved, That the Secretary call the roll, to ascertain the membership of the Board.

Hartford	County,	S. M. Wells.
New Haven	"	—— ——
New London	"	A. L. Avery.
Fairfield	"	—— ——
Windham	"	G. A. Penniman.
Litchfield	"	N. Hart.
Middlesex	"	J. M. Hubbard.
Tolland	"	—— ——

The report of the committee on member from Fairfield County was presented. The report was accepted, and the appointment of Mr. E. H. Smith approved.

The committee also reported action in Tolland County, and the election of Mr. S. F. West was accepted.

A vacancy was reported by the Secretary as existing in New Haven County, as the term of Mr. Pond had expired and there had been no election. On motion, W. H. Pond was reëlected to fill the vacancy.

Members appointed by the Governor:—E. H. Hyde, H. L. Stewart, J. T. Rockwell, and Albert Day.

Resolved, That the Secretary be directed to send circular notices of prospective vacancies in the Board to all societies interested, with the clause in the act referring to the appointment, and a blank certificate, to be filled with the name of the member so appointed, to be returned to the Secretary.

The Report of the Secretary was read and accepted. The Secretary also made a verbal report of single day meetings held at Birmingham, Bridgeport, New Canaan, Saybrook, Winsted, Hampton, Putnam, and Durham; also, of the progress and condition of the forthcoming report.

The report of the Treasurer was read and accepted.

Board adjourned to quarter to 2 P. M.

The Board met at a quarter before 2 P. M., Hon. E. H. Hyde in the chair, and adjourned to meet the Committee of Agriculture of the General Assembly, to meet again immediately after the conference.

The Board met at 4 P. M., Hon. E. H. Hyde in the chair. A committee of three were appointed to determine the time, subject, and location of the Winter Meeting, consisting of Messrs. Gold, Rockwell, and Penniman.

Voted, To proceed to the choice of officers.

Gov. C. R. Ingersoll, President.
Hon. E. H. Hyde, Vice-President.
T. S. Gold, Secretary.
N. Hart, Treasurer.
Prof. S. I. Smith, Entomologist.
Prof. Wm. H. Brewer, Botanist.
Prof. S. W. Johnson, Chemist.
P. M. Augur, Pomologist.
E. H. Hyde, T. S. Gold, H. L. Stewart, Commissioners on Diseases of Domestic Animals.
E. H. Hyde, H. L. Stewart, J. T. Rockwell, Auditors.

Voted, That the Committee on Diseases of Domestic Animals be authorized to employ such veterinary assistance as circumstances may demand.

Voted, That the Board pay Mr. Augur, the Pomologist, one hundred dollars for his services and expenses.

Voted, That E. H. Hyde, H. L. Stewart, J. T. Rockwell, Albert Day, and the Secretary, be appointed a committee to take such action in behalf of the Board in the matter of the Centennial as may seem proper.

Adjourned to 8 P. M.

The Board met at 8 P. M. according to adjournment, Hon. E. H. Hyde in the chair.

Resolved, That farms in Hartford and Tolland counties be visited by a committee of two each, consisting of Messrs. Hubbard, Day, Pond, and Stewart.

The appointment of the Board as visiting committee of Fairs was made as follows:

HARTFORD COUNTY, (no Fair,) Messrs. Hubbard and Pond.
Union, (East Windsor, Enfield, Somers, Ellington,) at Ellington, October 13th.
Bloomfield,

NEW HAVEN COUNTY, (no Fair,) Messrs. Avery and Augur.
Meriden, September 22–24.
Woodbridge and Bethany, October 6, 7.
Oxford, October 13.
Guilford, October 13.
Milford and Orange, October 6, 7.

NEW LONDON COUNTY, H. L. Stewart.
Norwich, September 14–16.

FAIRFIELD COUNTY, Messrs. Hart and Augur.
Norwalk, September 13–18.
Danbury, October 5–9.
Ridgefield, September 7–10.

WINDHAM COUNTY, S. M. Wells.
Brooklyn, September 21–23.
Woodstock, September 14–16.

LITCHFIELD COUNTY. Messrs. West and Penniman.
Litchfield, September 23.
Union, (Falls Village,) September 7, 8.
Watertown, September 29, 30.
Torrington, October 7, 8.

MIDDLESEX COUNTY, (no Fair,) E. H. Smith.

TOLLAND COUNTY, A. Day.
Rockville, September 29, 30.
Tolland County East,—Stafford Springs, October 6.
Hon. E. H. Hyde and T. S. Gold, Delegates at large.

Messrs. Pond, Hart, Augur, and Gold, were appointed Delegates to the American Pomological Convention at Chicago.

The Board then adjourned *sine die.*

T. S. GOLD, *Secretary.*

WEST CORNWALL, May 29th, 1875.

The Connecticut Board of Agriculture met at the Beardsley House, at West Winsted, Dec. 14th, at 8 P. M., Hon. E. H. Hyde, Vice-President, in the chair.

All the members of the Board were present except Gov. Ingersoll and Messrs. Pond and Smith.

The report of the Secretary was read and accepted.

The Secretary made a verbal report of the arrangements for the winter meeting at West Winsted, which were approved; also of action, as member of the committee on the centennial. After discussion the following resolution was passed:

Resolved, That a committee of three be appointed to confer with the State Centennial Committee for the purpose of securing an exhibition of the agricultural products of the State at the coming centennial.

Messrs. Augur, Stewart, and Gold, were appointed. The Board then adjourned to the call of the Secretary.

The Board met at 9 P. M., Thursday, December 16th, at the Beardsley House, Hon. E. H. Hyde in the Chair.

Reolved, That we recommend that the Secretary, with the Director of the Agricultural Experiment Station and the Pomologist, arrange for Lectures, on invitation of Farmers' Clubs and other associations. The Board adjourned *sine die.*

T. S. GOLD, *Secretary.*

WINTER MEETINGS.

A Farmers' Convention was held at West Winsted, for Lectures and Discussions, Dec. 15th, 16th, and 17th.

The sessions were held in Camp's Hall, the use of which was generously contributed by the citizens of Winsted. The attendance was large, and the subjects presented by the Lecturers, and drawn from the question box, kept up the interest to the close of the sessions.

Subjects—Fences, Roads, Farm Buildings, and their location, Water Supply, and Drainage of Farm Houses and Buildings, in their sanitary relations. The exhibition of winter fruit manifested increasing interest in this department.

The meeting was called to order on Wednesday, at 10 A. M., by the Hon. E. H. Hyde, of Stafford, Vice-President of the Board. The Secretary, T. S. Gold, of West Cornwall, presented a paper as introductory to the exercises.

INTRODUCTION.

As a kind of preface or introduction to this Session of the Board of Agriculture of Connecticut, allow me to call your attention briefly to the various subjects which have been selected for Lectures and Discussion. Though somewhat diverse in name, and some of them not often discussed among farmers, yet we shall find them closely allied and intimately connected not only with the daily life of our farms but with each other, in fact as truly placed at the foundation of successful agriculture in its fullest sense as any of the topics we have heretofore discussed.

First we have "FENCES AND FENCING." When we know that many a farm in the State can be bought for less than what the fences have cost, that secure fences are essential to good farming, that these are the exception rather than the rule upon the farms in this State, and that as often constructed they are subject to a decay of at least ten per cent. annually, requiring that proportion of their first cost in repairs to keep them good, it seems time for us to inquire whether our expenditures in this line are governed by true economy, not only in the amount of fences but also in the materials used and mode of construction, and whether the changing conditions of our agriculture do not call for reform here as well as in other departments. The size of our fields has much to do with convenience and profit in the use of labor saving machinery in cultivating and harvesting our crops. Probably less thought is bestowed upon this subject by the average farmer than upon any other in our calling, and it is left too much in the hands of ignorant laborers.

We hope the discussion will set this matter in its true light, that what we now know and may here learn may be so enforced, that we shall put this knowledge to practical use.

Next is to come a paper on "COMMON ROADS,—THEIR CONSTRUCTION AND METHODS OF THEIR IMPROVEMENT."

The importance of this subject to farmers exists not only in the fact that they are mostly the road-makers, but that they are also the principal road-*users*, and that in addition to this, they bear almost the whole burden of the cost of using them by other classes in the community. This may seem as an extreme claim, yet who cannot see that the professional man or mechanic who visits a farmer in the line of business, charges just in proportion to the difficulty of reaching the farm. Thus he has to bear not only the expense of his own travel but also that of every trader who comes to buy or sell,—the doctor, the lawyer, the plumber, and so on to the end of the list,—all those with whom he has dealings.

Time was when every one lived in the centre, when it might be said that if the farm was farther from one place it was nearer to another, but the opening of railroads has wrought a change; every kind of business, mechanical or professional, except the farm, is removed to the railroad stations, and the tendency is to still farther centralization, so that the *location* of a farm and even of its buildings is a matter of much more importance than formerly, and in direct connection with location are the roads uniting the farm with the great channels of trade and commerce.

The resistance to traffic caused by the natural forces of gravity and friction merit our study. These can be relieved by proper grading, and providing a smooth unyielding surface.

Drainage is so important for the durability and efficiency of a road, that the subject of gutters and sluices will of course be discussed.

The inexperience and haste of those who originally laid out our roads, connected with the personal interests of adjoining proprietors, have saddled us with roads not only badly located but in many cases we have far too many roads. The cost of repairing exhausts our money, and still we lack what we need, roads most direct—of the easiest possible grades—and constructed of such materials and in such a manner as to insure the best road for travel, consistent with the conditions of climate and the amount of means allowed to be expended.

Proper system and skill will do as much for our roads as for any other branch of industry, and hitherto but little has been applied.

Next comes "FARM BUILDINGS AND THEIR LOCATION." We have only to travel through the rural districts in any direction, or in our villages, to become convinced that accident or caprice rather than judgment has governed in the planning and location of Farm Buildings.

Proper location demands something besides proximity to the traveled highway, which to our ancestors seemed the only thing desirable, and adaptation to the needs of the occupants is another essential.

"FARM LAW AS APPLIED TO ROADS AND BOUNDARIES," harmonizes with the kindred subjects—the construction of roads and fences.

Here we may learn: how roads are laid out, the rights of adjoining proprietors, about pasturing on highways, encroachments, private roads, rights of way, turnpikes, accidents to travelers from neglect to repair, &c.

Boundaries: about fences on highways and line fences, unruly cattle, boundaries on streams, natural and artificial ponds, use of water by riparian proprietors, building on the line, trees on or near the line, restoring lost boundaries, these and similar matters will be explained by the Lecturer, and your verbal inquiries at the close of the lecture will help to clear up all obscure points.

"THE WATER SUPPLY AND DRAINAGE OF FARM HOUSES AND BUILDINGS IN THEIR SANITARY RELATIONS."

Civilization brings its penalties as well as its rewards—while we avoid some forms of disease we rush into the fatal embrace of others.

It is our own fault, as farmers, if we are not, with our families, the healthiest class on earth.

I fear we are not, and it is by the neglect of the simplest rules that should govern in the water supply and drainage of our dwellings that much of this suffering comes upon us.

With more knowledge, everywhere diffused, we hope yet to see our rural population enjoying that measure of health which is our birthright; without health in the farmer, and his family, there can be no happy farm life.

"THE SUBJECT OF FENCES AND DIVISION OF FARM LANDS" is thought to be of sufficient importance to require more time for its examination than one session will allow. A proper or improper arrangement of the division fences on a farm often settles the question whether it can be *profitably* farmed or not, while the beauty to the eye, of a farm, and of course in a large degree, its value in the market, may be destroyed or improved according to the attention bestowed upon this one particular.

Friday morning, the committee on agricultural experiment stations will be called upon for their report—to be followed by some account of the organization of the institution at Middletown, and the work now in progress, by the Director, Prof. W. O. Atwater.

We have high hopes, that by calling to our aid the exact methods of science, some of those problems which have so long puzzled the farmer in his attempts at their solution, and which are so vital to advancement in agriculture, will be settled. They relate often to the most subtle processes of nature, even those connected with animal and vegetable life, and are beyond the cognizance of our unaided senses. Chemistry teaches us about many unseen powers with which we have daily connection—and while it has already done more for the arts and agriculture than any other department of science, much still remains to be done.

It is for our farmers to ask about what they want to know, and for this experiment station to seek the solution of their questions.

A discussion on roads will follow, to be opened by some statistics derived from the answers of correspondents to the questions contained in the circular on that subject.

"FARMERS' HOMES, AND HOW TO USE THEM" will come in as a fitting close to the general work of the session, leaving the Report of the Pomologist and discussion on Fruit culture to drop in, as it were, as an accessory or attendant upon our other farming—a sort of side affair, but as we hope, to show one by us never to be neglected on that account. The show of fruit under the charge of our indefatigable pomologist is for study and testing during the intervals of more serious work, and as affording an opportunity of promoting acquaintance—encouraging good fellowship, we think its benefits will be fully equal to that it may accomplish in encouraging the culture of good fruit.

The *question box* will always be open to receive your written inquiries upon any agricultural topic to be referred to the person who has the subject in charge, or to the audience for answer. Verbal inquiries will be in order after each lecture, and each speaker will be expected to explain or defend any position he may assume.

Excuse me for attempting to set before you thus, the bill of fare we furnish, knowing that I am advancing on ground to be thoroughly held by those better qualified than I am to discuss these questions, and for whom I bespeak your candid and careful attention.

The President then introduced J. M. HUBBARD, of Middletown, who read a paper on

FENCES AND FENCE MATERIALS.

The amount of improved farm land in the State of Connecticut, is reported by the census of 1870, at 1,646,752 acres.

If, for the purpose of estimating the amount of fence thereon, we assume that the highways are equal to one around each square mile; and the subdivisions sufficient to divide each square mile into forty-acre fields, we shall have 10,292 miles of fence on highway lines, and 15,438 miles of interior fence, making an aggregate of 25,730 miles.

As to cost, a good fence of posts and rails, or posts and sawed slats, can be built for $1.50 per rod. Stone wall would usually cost more than this, while ruder forms of rail or pole fence could be built for considerably less.

If our calculations of cost are made upon the basis of $1.00 per rod, I think we shall be at least sure of avoiding any overstatement of the matter. This gives us the sum of $8,233,600 invested in farm fences in the State of Connecticut, and so far as my observation extends, the estimate is in all respects a very moderate one. Upon this sum, the annual interest at the rate of 7 per cent., amounts to $576,352.00. In addition to this, these fences require constant repairs and renewals, which I estimate as equal each year to five per cent. of their cost, or equal to a rebuilding once in twenty years. This gives the sum of $411,680, for repairs and renewals, which added to the interest on first cost, makes the total yearly cost of maintaining farm fences in the State, $988,032. I think the other $12,000 might fairly be added, and the statement broadly made, that the farmers of Connecticut pay a million dollars annually for the maintenance of their fences. And what they pay is not all these fences cost them. Fences occupy room, and obstruct cultivation, and shelter useless and noxious plants. Assuming as I think we fairly may, that the ordinary fence occupies, or obstructs, so as to withdraw from culture, a space 5½ feet in width, and we have 17,153 acres occupied in this way. I will not pursue this line of thought further. The elements of fence cost represented by the hedge-rows that it harbors, and by the additional labor it compels in the culture of our fields, I will leave each individual to estimate for himself. I believe the facts already presented, show the subject to be of sufficient importance to merit a careful consideration at our hands, and I therefore venture to ask your attention for a few minutes to the uses of fence in farm economy. We have seen that its cost is heavy;

let us see what return it makes, and whether its cost is in whole, or in part, justified ?

The use and the only use of fence is the protection it affords to our crops during their period of growth.

The most perfect fence ever built never caused two blades of grass to grow where but one would otherwise have grown, or increased the productive capacity of any field, to the amount of one kernel of corn or wheat.

If we could dispense with our domestic animals, the source of this constant danger to our growing crops, or by any less costly practice or device restrain them, we could dispense also with our fences and save that annual million. But our domestic animals are a necessity to us, and while I suppose there are not wanting many, who would maintain that other methods than fencing and pasturing were more advantageous for keeping them ; yet so many practical difficulties stand in the way of the adoption of such methods, so many changes must first be wrought in fixed habits and methods of labor and business, that I do not suppose the most ardent advocates of these new methods expect soon to witness their general acceptance.

A question of more present practical importance for the consideration of every farmer is this: By what arrangement of fields, by the use of what materials, by the adoption of what forms and methods of construction, can I afford the necessary protection to my crops at least cost ? Granting the expense of this protection to be, under our present law and practice, necessary, it will be seen that the return it yields does not necessarily bear any proportion to the outlay, and it becomes an important question of farm arrangement to reduce this fence outlay to the lowest effective limit. It is necessary however, that it should be effective ; and this brings me to my first suggestion which is as follows :

Wherever a fence is necessary, let it be sufficient for the needs of the situation.

This term fence is borrowed from the vocabulary of war, and military illustrations of the subject under discussion are pertinent. Good generalship is what the farmer should show in the management of his fences. Good generalship never leaves an important portion of the line of occupation so insufficiently guarded as to invite the incursions of the enemy. True, one or many raids may be repelled, but the effort necessary to do this, added to the damage inflicted, and the training and encouragement the enemy receives, tell heavily against the party suffering from them. The farmer who is growing valuable crops which are protected from marauding animals by insufficient fences, is much in the condition of the general whose extended and poorly guarded lines invite the incursions of a watchful and active foe: and the situation is not to be desired or recommended.

The second suggestion in this connection is as follows: Whenever the farmer cannot clearly see and show that the value of the thing defended is greater than the cost of defense, let the effort at defense be abandoned. It is my personal belief that the carrying into effect of this suggestion would involve the abandonment of very many interior fences, to the great relief of those who are struggling to maintain them. I often see an elaborate system of division fences maintained at great cost, where the only advantage seems to be, that the farmer is enabled to pasture, for a few weeks or months, some part of these enclosures, while the others are occupied with crops. Counting this advantage at its highest value, I very much doubt if it equals the fence cost, but beyond this, and although it may be going a little outside of my subject, I am constrained to say that in many of these cases, the cropping of the aftermath is a greater injury to the field than its whole value as pasturage, and the cost of maintaining the fence is wholly thrown away. Now when I address myself to those farmers who feel that the maintenance of their fences is a great burden; who devote to that purpose all the outlay of material and labor which they feel that they can possibly afford, and find it insufficient; and who are scarcely ever free from a feeling of anxiety lest some valuable crop suffer from the incursions of marauding animals, I feel that I am addressing a large audience, and one for whom I would like to suggest some measure of relief, if it were in my power. I urge all farmers, thus situated, to give the matter careful consideration, and see if they cannot wisely dispense with some of the interior fences they are now maintaining. I would not have them rest upon a vague impression that they cannot spare the fall feed from this field or that, but bring the whole question to the test of careful estimates and calculations, and let it be settled by the remorseless logic of figures. If they are keeping so much stock that every mouthful of fall feed is needed to carry them through the season, and they cannot wait for it until the crops are all removed, let them consider seriously whether their farms are not overstocked, and whether an equal or greater profit might not be derived from fewer animals better kept.

Now, as a general statement, these fences may be said to be necessary. 1st. Those on highway lines, and between different proprietors. 2d. Those necessary to separate the land in pasture from that under culture. But the different crops do not need to be defended from each other; the corn and potatoes will not quarrel, the grass and grain will mature and ripen peacefully side by side; and the advantage of being able to pasture the grass and grain stubble before the corn is harvested, I am sure does not pay for the expense, the inconvenience, and the injury of a dividing fence. I am glad to notice on very many farms that come under my observation, a disposition to dispense with interior fences.

It is a disposition which may be still farther indulged to advantage. In regard to fence materials but little need to be said, as that is a question which the circumstances of each case must decide.

Where stone are convenient, and especially where they need to be removed to fit the soil for culture, they should undoubtedly have the preference. A well laid stone-wall approaches about as near to permanence as any of the ordinary works of man. But this very element of permanence, of great value where the need is also permanent, may become a serious objection where changes of management or ownership involve changes also in the dividing lines of fields. These changes occur so frequently, that it would seem wise to restrict stone fences to highway lines, and such interior divisions as seem pointed out by nature to be permanent.

Iron, in the form of wire, has been used as a fence material on the western prairies, where the scarcity of timber and stone makes a resort to some other material a necessity. Good fences are made of it at a reasonable cost, but it does not seem to possess any advantage that will enable it to supplant wood, where the latter material is reasonably plenty. Another resort upon the prairies is to the hedge, a form of fence possessing obvious and great merits, and, at the same time, open to grave objections. Its merits lie in its durability, and the perfect protection it affords if well kept. The objections to it are, the great and constant care required to keep it in condition, the extent to which its roots occupy the soil, and in high latitudes, its liability to winter-kill. These objections are probably sufficient to prevent its general adoption wherever timber is plenty.

Wood is the material which, by its wide distribution, its reasonable durability, and the facility with which it can be wrought into almost any form to suit the necessity or fancy of the user, proves most generally acceptable as fence material.

Out of this ready substance, with no tool but his axe, wedges, and splitting maul, the farmer can erect a substantial and durable fence, or if the value of the raw material is an objection to the lavish use which these ruder methods involve, a convenient saw-mill will put it in form to use much more economically in the construction of a fence both neat and substantial. And this leads me naturally to the consideration of different forms of fence.

Variety of form in farm fences is almost wholly confined to those constructed of wood, as stone, iron, or hedging, each admit, practically of but one form. I do not propose to condemn absolutely, any of the forms of wooden fence which have been made use of by American farmers. Where timber is plenty and convenient, land cheap, and, in large proportion unenclosed, and domestic animals of all kinds run at large, even the old ten-rail Virginia worm fence may best answer the requirements of the situation. None other more perfectly fills the definition of a good fence given by a western farmer in the following specifications, "Horse high, hog tight, and bull strong." But where timber is of any considerable value, its consumption of material is frightful. Then when set with the sharp zigzag form, necessary to give it strength, the amount of land occupied by it is much greater than by any other form of fence, and where land is valuable constitutes a grave objection to its use. I am inclined to think that there are not many situations in Connecticut where its adoption should be recommended.

The form of fence which gives the requisite strength with the least expenditure of material and waste of land, is undoubtedly the straight fence of posts and rails, or posts and sawed slats. Its obvious advantages fully justify the high favor in which it is held, and I only care to occupy your time in connection with it, with one or two practical suggestions concerning its construction and management. And first in regard to the posts. Upon these mainly the strength and durability of this form of fence depends. The labor of preparing the materials is largely expended upon the posts, and is the same whether they are large or small, of good or poor materials. Certainly the folly of using poor materials for this purpose is too evident for argument, and is generally recognized and avoided. Ought not the folly of using a small post to be equally evident? Posts set in the ground decay from the outside, and other things being equal, their durability is in direct proportion to their size. Now the size of a post is only a small element of its cost as it stands in the completed fence, and if by doubling one small item of its cost the life of the whole structure can be doubled, the wisdom of such a course would seem perfectly clear. Use only posts of good material and good size, ought to be an axiom with the fence builder. But not only should the posts be of good size and material, they should be set sufficiently close to carry the fence, if I may use the expression, without effort. I have seen fences where the posts suggested to my mind the idea of men carrying loads too heavy for their strength.

They lean one way or another from the perpendicular, until at length the rails begin to slip from their holding hands, and fall to the ground. Then begins an experience about as unsatisfactory as any I know of. To be constantly repairing a fence that ought not to need repairs: to be ever striving to give strength to a structure, weak in a point so essential that it can be remedied only by a thorough reconstruction, if this be not patience trying, I do not know what is. My advice is, to avoid it by the use of large posts and plenty of them.

A fault altogether too common in the preparation of rails for a fence to be built with mortised posts may deserve a notice here. It consists in making the wedge-like taper at the end of the rail too short and thick. It should be sufficiently long to allow the ends of each rail to pass entirely through the post and project at least six inches, on the further side, so that the leverage of the rails against each other should present a strong resistance to any lateral inclination of the post.

My next and last suggestion in this connection is, do not put off too long the entire rebuilding of your failing fence. The best selection of posts will of course be of uneven durability, and so long as any considerable number remain firm, it may be well to strengthen the weak ones by setting stakes at their sides, and securing them firmly thereto with wire or nails. But when they all get weak and are prevented from falling only by props which support them on this side or that as their necessities indicate, and which are always failing with any special stress, then certainly it is time for a thorough reconstruction. For besides being an unsightly feature in the landscape, and a constant source of anxiety, and a frequent occasion of expenditure to the owner; such a fence is too apt to be a prolific source of neighborhood trouble.

To the rough fence of poles, crotches, and stakes, I give only a word that it may not be wholly overlooked. For the temporary restraint of the larger domestic animals, it is well adapted, and the low value of its materials and the rapidity with which it can be constructed, fully justify its use for that purpose. Throughout this discussion, with one exception, I have assumed the element of permanence in fence structures as of great value, but I now propose to limit this assumption still further, or rather, I propose to make a distinction which I have not hitherto made, between permanence and durability as applied to fence structures. By the term durable, I shall designate a fence that will not soon decay or fail. By the term permanent, I shall designate one that is both durable and fixed in position; one not easily removed and not designed to be removed. Now durable fences are desirable everywhere, but except upon highway lines and between different proprietors, permanent fences are in my judgment very undesirable.

I hold then responsible for waste of soil, for much inconvenience and additional labor in the conduct of farm operations, and for the nurture of unsightly hedge-rows where every useless and noxious plant stands upon its defense and defies the farmer, in general, successfully. Even between permanent pasture and cultivated fields, I would not have the line of division constant, or the fence permanent. As often as necessary to repress the hedge-row, I would move the fence far enough one way or the other, to expose the incipient hedge to the merciless plow on one side, or the bush scythe and the cropping of domestic animals on the other. I apprehend that the chief obstacle to the more general adoption of portable fences is to be found in the general conviction, that such forms of fence are either too expensive in their construction, or unsafe in their operation to justify their use.

And yet it would seem that the inventive genius of our country ought to be equal to the task of supplying us with a form of portable fence, at once effective and reasonably cheap. And as a step towards this desirable end, I beg leave to present here a model of a portable fence which has been in use on my farm for several years, with growing favor. It is certainly inexpensive and easily constructed, and in my experience effective. Moreover, its leaning position, which at first may seem objectionable, has in its favor some quite important considerations. I think an animal on either side would be less inclined to attempt to jump it than if it stood upright, and where used, as most of our interior fences are, to divide pasture from fields under cultivation, by leaning it away from the cultivated field, all the operations of culture can be carried close to the fence much more conveniently than if it stood erect. I like it so well that I shall extend its use upon my own farm whenever I have occasion to renew or change interior fences, and finally, there is no patent, or patent applied for, on it to restrict its use.

Now I apprehend there is not a farmer here, or hardly one in the State, however extensive and elaborate his system of division fences may be, who does not occasionally feel the need of a portable fence. It is hardly possible that his permanent fences will always be in just the place he needs them. Fields, however small, are rarely of that uniform texture of soil, or subject to conditions of moisture, drainage, &c., so uniform as to require uniform treatment in cultivation. If in grass, one portion will require breaking up and re-seeding before the rest, or one part will bear pasturing, which would injure the other part. Or, if one is so fortunate as to have no trouble of this kind, the size of the field will not always agree with the extent to which he wishes to cultivate the particular crop he designs to occupy it. Or in the management of domestic animals difficulties occur. Many times one wishes to separate and assort his herd. A few animals may require exceptional restraint, or need special care and favor. Or a portion of some field may furnish valuable and needed pasturage, while the remainder is occupied with some crop. Or it may be desired to raise some forage crop, to be fed off upon the ground, and to prevent waste it is necessary to give the herd access to but a small portion of the field at a time. These and similar exigencies which are constantly arising in farm operations, it is hardly possible to meet by any system of permanent division fences. The attempt to meet them in this way, loads the farmer with a heavy burden of expense, subjects him to additional labor, difficulty, and annoyance in the conduct of farm operations, and then fails to accomplish its object. Now, if portable fences are practicable, if they can be constructed cheaply, and can be made effective, are they not very much to be preferred? They can be placed just precisely where they are needed. They can be easily and speedily transferred from one place and use, to another.

When not in use, they can be stored in some shed or farm lumber-yard, and be out of the way. Much less in amount will answer the requirements of the farmer, as the same fence can be used successively for different purposes. Finally, where portable fences are in use, the boundaries of fields will not be marked, in addition to the fence, by a line of elder, white birch, or wild cherry, or even by briers and golden-rod; features in the landscape, which the artist on a vacation appreciates far more highly than the farmer.

This brings me about to the close of what I have to say, and as my treatment of the subject has been somewhat desultory, I may be pardoned for repeating here, the main points I have had in mind.

1st. Maintain no unprofitable fences.

2d. Let what fences you do maintain be good and sufficient.

3d. For the selection of fence materials and the determination of form, no rule can be given; these must be determined by a wise regard for the circumstances of each case.

4th. The strength and durability of a post fence depends chiefly upon the posts. They should be of the best material, and not stinted in number or size.

5th. For interior divisions, use portable forms of fence, and until you find something better I recommend the form which I have shown here.

As you will perceive, my remarks have been limited strictly to farm fences. The subject of village fences is an attractive one, but the considerations involved in its treatment are entirely distinct from those that control in the matters of farm fences. I do not know that it is properly included in the programme of this meeting; at all events I do not propose to enter upon it in the least, but only to direct attention to it as a matter of great public interest, and one that stands much in need of study, discussion, and wise action in the direction of improved practice.

Mr. Albert Moore, of Salisbury. Would not an unruly ox lift up the fence on his horns?

Mr. Hubbard. Turn an unruly animal to beef.

Mr. Moore. How with small animals; will not they run under the braces and lift it up?

Mr. West, of Columbia. Do you fasten in the braces—can they be taken out?

Mr. Hubbard. They are fastened in, and can be taken out.

Question. Would it not be a good plan to have the boards run by, so as to rest against the next post.

Mr. Hubbard. It might be done, but there is no necessity, as it rarely blows over.

Mr. S. M. Wells, of Wethersfield. What is the cost per rod?

Mr. Hubbard. Two posts five feet long, 2 by 4 inches, with four slats, each six inches wide, makes two feet of lumber for each running foot, besides the posts, which will equal about three-quarters of a foot, or about 45 feet per rod. Cheap lumber may be used.

Mr. Wells. Has Mr. Hubbard estimated the difference between large and small fields in the amount of fence required? A fence 40 rods by 10 rods, 2½ acres, requiring 100 rods of fence at $1.00 per rod, makes the first cost $40 per acre; 7 per cent. on this, and 10 per cent. for repairs, brings the annual cost of fencing per acre $6.80—that is a field.

40 × 10 rods = 2½ acres, requires 100 rods, at $1.00 per rod, costs $45 per acre; annual tax, $6.80.
40 × 40 rods = 10 acres, requires 160 rods, at $1.00 per rod, costs $16.00 per acre; annual tax, $2.72.
80 × 80 rods = 40 acres, requires 320 rods, at $1.00 per rod, costs $8.00 per acre; annual tax, $1.36.
126 × 126 rods = 100 acres, requires 404 rods, at $1.00 per rod, costs $4.04 per acre; annual tax, 85 cents.

Mr. A. L. Avery, of Groton. Step on to the railroad, and see that circumstances alter cases; all rail fence in one place, and all stone fence in another. Hence the abundance of any fencing material should govern in the kind to be employed. There was much rail fence on my own farm when I took possession of it, and I have changed it all for wall, except movable rail fence for stacks. I should fear that cattle, even if not unruly, would rub down this portable fence. I advocate stone fences from their durability and the small cost of repairs. In two or three days my two men repair all my walls on 300 acres. Rail fences require withes every year, and settle so much that the repairs in ten years equal the original cost. With our new stone-diggers and wall-builders you can build a wall of large stones five feet high. My neighbor, last fall, laid in stones of five tons. A machine was exhibited on the New London Fair Ground last fall which took out stones, with one yoke of oxen on the rope, six feet long, four feet wide, and three feet thick, estimated to weigh six tons. We build walls with these machines at one-third the cost of man power.

Mr. MOORE. Do you build walls with machines?

Mr. AVERY. Yes, when we have large stones.

Mr. MOORE. Cut a ditch to hardpan where the wall is to be, and fill with small stones, as walls built on the surface soon fall down. Walls are more expensive to keep in repair than rail fence. The interest of the money a wall costs would build and maintain a board fence. I would agree with Mr. Hubbard, to take out the zig-zag from rail fence. Attach the rails to the posts with spikes or with wire. I would recommend planting one acre—one-sixth locust, and five-sixths chestnut—on every hundred acres, to supply fencing timber. Locust posts will last for ever. Locust sleepers on the Harlem railroad have outlasted three sets of other timber. The locust grows fast, and has very little sap. Plant yellow locusts on every waste spot.

P. M. AUGUR, of Middlefield. Wire fences may be used to very great advantage in certain places. I bought a lot of old telegraph wire and put up twenty rods; placed posts twenty feet apart, with rests between the posts to keep the wires in place; put a hand-vice on the end and straightened the wire, and drove in staples at the posts. It proved very satisfactory; no shade—you can mow close up. It is perfect for cattle. There is no drifting by highways. Small enclosures are objectionable, as double the number of rods required to fence one acre will fence four acres; twice that for four acres will fence sixteen, and so on.

Mr. **Moore.** Animals sometimes get hurt by running against wire fence, and I have abandoned it.

Mr. **West.** The varied character of our soil requires small fields in many cases: also the abundance of stone encourages the practice. I approve of trenches under walls in wet places, and to get rid of the stone. I have a wall on dry land that has stood over one hundred years. I would advise the old worm fence for outlying fence, if we can get good rails.

Mr. **Moore.** That's it. The plaguey *if* is in the way. In making a fence, turn a furrow and save the bottom board or rail.

Mr. T. L. **Hart**, of Sharon. There is an *if* in the way also about raising locusts. The trunks are full of borers which spread to the adjoining trees. I advise a top rail for wire fence that animals can see it. Where stones are as plenty as they are in Litchfield county we need not seek for other fencing material.

Mr. **Moore.** There are two kinds of locust, the yellow and the black. The latter is attacked by the borer, but I cannot learn that the former ever is.

Mr. **Gold.** Mr. Hart will allow me to correct him about the locust borer. They are confined to the locust, and do not infest other trees. Also I think Mr. Moore is in error about there being two distinct kinds of locust, the yellow and the black. I think the only difference arises from the soil, and accidental variation, and that there is no botanical distinction between them. Mr. Stewart has had experience in the use of the timber, and can probably settle the question.

Mr. **Stewart**, of Middle Haddam. I think I can partially answer that question. Some years ago, when I was engaged in ship-building, in some places where we got yellow locust timber, we found that it was almost invariably filled with borers, so that it was unfit for ship-timber. In other places we got very clear timber that went by the same name—yellow locust. After a time, in those places where we had got clear timber, entirely free from borers, the timber became filled with borers, so that it was worthless for ship-building purposes. The borer that infests this tree is different from the borer that infests the apple, the quince, and the peach. Each tree has its own peculiar borer.

Mr. GOLD. Does not the same borer which infests the apple tree infest the quince also?

Mr. STEWART. Yes, sir.

Mr. GOLD. But it is not in the peach, is it?

Mr. STEWART. No, sir.

Mr. CARRINGTON, of Colebrook. I have cultivated the yellow locust to a considerable extent, and some twenty years ago, the trees were very much infested with borers, but for some cause or other, I know not what, they have disappeared. I have not noticed one in any of my trees for twenty years.

Mr. MOORE. My authority in speaking in regard to the locust is this. I had discovered that the locust trees of a townsman of mine were different from mine, not in the blossom, or shape of the leaf, or in the texture of the bark, but I noticed that after the leaves had fallen, the pods which remained on his trees were long, smooth and thin, while the pods on my trees were short, and curled up. I asked him about it, and he said he had bought the seed in Albany, as yellow locust seed; he planted them as yellow locust, and they were yellow locust. And in looking at the timber which had been cut, I saw there was a difference in the color; the wood of his trees was yellow, while the wood of the trees that I have growing is almost black. I took some of the pods from the yellow locust and cut them open, and have got the seeds in my pocket. Those seeds are small and rather light-colored, whereas mine is a larger and darker seed.

QUESTION. Does the locust have a flower?

Mr. MOORE. Mine flower; I do not know how it is with the yellow. The gentleman to whom I have referred is Gov. Holley, at Lakeville. A neighbor of his got some yellow locust seed at Springfield, and his trees are the same as Gov. Holley's, whereas mine are unlike theirs.

Mr. N. **Hart**, of West Cornwall. Any difference in the soil in which they grow?

Mr. **Moore**. Yes, sir, between his soil and mine there is a difference. Mine is gravelly-soil, and his rather more loamy. That is all the difference. The soil in which they grow at Lakeville, on Gov. Holley's place, is a loamy, rich soil.*

Mr. S. M. **Wells**, of Wethersfield. In regard to fences, we are required to maintain a great many fences which we do not need. The law requires us to maintain division fences, and throughout a large part of the State, they are not needed. I think, therefore, that one of the first movements the farmers should make, should be to obtain a repeal of that law, and have a different one established. Now, we are obliged to protect our crops, instead of restraining our cattle. A great many farmers, and a great many land-owners have no cattle to restrain, but they are obliged to fence in their crops against the cattle of adjoining farmers or land-owners, in order that they may grow their crops to advantage.

Mr. **Gold**. That topic will come up more properly when we discuss "The Law of Highways and Boundaries."

Adjourned to 2 o'clock.

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* The Locust (*Robinia Pseudacacia*) runs into numerous varieties, in different sections of the country, owing to variation in soil and other circumstances. This gives rise to various local names. In Maine and some other parts of New England, it is called "Yellow Locust;" in other parts of the United States it is known as the "Black Locust," "White Locust," "Green Locust," and "Red Locust." Botanically they are the same, yet differ in the durability of the timber they produce. Downing says, "The Black Locust appears less liable to the attacks of the borer than the other varieties." There is another species, *R. Viscosa*, that is a smaller tree, and not cultivated for timber. T. S. G.

AFTERNOON SESSION.

The Board re-assembled at 2 o'clock.

COMMON ROADS.

Principles involved in their Construction, and Methods for their Improvement.

By E. P. Augur, Civil Engineer, Middletown.

No institutions are more necessary to the existence and well-being of a civilized community than its common roads. The correctness of this statement may not be, at first, apparent. Yet if we imagine a community having no roads, and think of the many institutions and industries which could not exist without such facilities for traffic and intercourse as only common roads afford, the assertion will no longer seem extravagant. Common roads are of fundamental importance to the social, industrial, and civil institutions of any well ordered community.

It is very generally and erroneously supposed that railroads have detracted largely from the usefulness and importance which, formerly, may have belonged to common roads. Hence it is, perhaps, that the latter have been so generally underrated. No one can deny that the marvelous growth of our nation during the last half century has been largely due to railroads. They afford facilities for enormous traffic and rapid transit which, with no other means of intercourse than common roads afford, would be impossible. Railways have supplanted common roads only as main thoroughfares of traffic and travel. This is the sphere of their usefulness. To common roads still belong the more varied and general uses of the community, which constitute so large a part of social and commercial intercourse for which railways, from the great cost and other peculiarities of their construction and operation, are wholly unadapted. The introduction and use of railroads have *enhanced*, rather than detracted from, the importance of common roads, since by means of the latter a large part of the traffic of railways must come from its sources and reach its ultimate destination. Railways depend greatly for their successful operation upon good and sufficiently numerous common roads, without which as a means of traffic they would be very incomplete. They no more lessen the importance of common roads than do colleges and seminaries lessen the importance of common schools. Each have their own sphere of usefulness in the great system of social and commercial intercourse. Railways and common roads have been styled the artories and veins of the body politic through which flow the products of agriculture and manufacture and the supplies of commerce, the life-blood of the state.

The activities of the body are mainly at its extremities, to and from which through myriads of small veins the blood must course freely or the activities become paralyzed. The activities of a community are in its factories, on its farms, in its homes, to and from which supplies and products must be transported for greater or less distances over common roads. Poor roads impede the prosperity and paralyze the industries of any section where they exist; while, by improving roads within the limits of wise economy, the social and industrial interests of a community will be correspondingly advanced.

Good roads are of especial value to agricultural communities. The profits of farming depend largely upon the cost of getting produce to market. If by improving the roads double the load could be drawn, the cost of traffic over them would be reduced one-half; or the distance from which produce could be drawn with profit would be doubled. One-fourth the time now required for light traffic might be saved if our almost universally poor roads were what they should be. Vehicles and harness would be much more durable, and the vigor and usefulness of horses and cattle would be greatly prolonged.

Good roads contribute largely to the pleasures of rural life. Who does not like to ride after a good horse over a good road? To farmers this means of enjoyment may be available at slight cost. The occasional errands to the post-office or market, matters of business and necessity, should also be opportunities for pleasure and recreation. Good roads would tend to make them such.

Improving the roads would promote and increase the social advantages of country life. The families of farmers have far too little intercourse one with another. That this is somewhat due to poor roads can hardly be doubted. At the seasons when farmers have most leisure the roads, for much of the time, are either so muddy or so rough as to discourage any inclination for visiting at each other's homes. When the roads are best, the time and energies of farmers and their families are too much absorbed in the labors of the farm to admit of much social intercourse.

Bad roads occasion much of the injury and abuse of horses and cattle. A team is often injured more by being "set" in some slough of the road, than by all the ordinary work of a whole season. The frequent brutality of teamsters under such circumstances justly merits the indignation of every one, and the penalty of the law. Good roads would prevent much of such injury and abuse.

Under the various systems of road management existing in this State, farmers are, to a great extent, the makers and repairers of common roads. It therefore devolves on farmers, as *road-makers*, to know how to use the public funds appropriated for the maintenance of the roads, so as to secure, in the highest degree possible, the ease of traffic and the speed and pleasure of travel. It certainly devolves on farmers, as *citizens*, whatever system of road management may exist, to understand the simpler principles upon which the proper construction of roads depend, that they may act intelligently with reference to methods and expenditures for their maintenance and improvement. Farmers, of all others, should take deep interest in, and encourage the improvement of common roads, since upon the existence of good roads their success and happiness so largely depend.

Having thus briefly alluded to the general importance of common roads, and to the relations and responsibilities of farmers concerning them, let us proceed to consider the principal forces which oppose traction on roads, and under what conditions they present the least resistance.

The resistance to traction upon roads, results mainly from two natural forces, GRAVITY and FRICTION. GRAVITY *opposes* forward motion on *rising* grades, and *causes*, or *aids* to cause, forward motion on *falling* grades, while on level grades it does neither. FRICTION is a *constantly opposing* force. To overcome the resistance of one or both of these forces, and produce motion, another force is applied, called DRAFT. The DRAFT applied must always equal, or, strictly speaking, it must slightly exceed, the resistance of the opposing force, or forces, before a vehicle will move along. GRAVITY and FRICTION act spontaneously in obedience to natural laws. Draft, on common roads, is at present the muscular force of horses and cattle. Draft, therefore, involves a twofold cost: first, for the animals exerting it, and secondly, for their equipment and keeping. Hence the less the draft required on any road for a given amount of traffic, or, which is the same thing, the less the resistance of *gravity* and *friction*, the less the cost of traffic over the road.

In the construction or improvement of a road the aim should be to make the resistance of these opposing forces as small and as nearly uniform throughout its length, under the varying conditions of climate as is possible within the limits of reasonable cost. Let us consider the forces already mentioned more particularly, that we may ascertain how roads should be constructed with reference to them.

Gravity tends to draw all bodies toward the earth's center. This is the force which makes a cart or wagon roll down hill of itself, or which necessitates a holding-back force, or the use of brakes in descending steep hills with heavy loads. Gravity also occasions the extra draft required to move a load up a hill. The amount of its resistance may be accurately determined when the rise of the grade and the weight of the vehicle and its load are known, it being always such a proportion of the weight as is the rise from level of the length of road surface in which the rise occurs. The following figure (Fig. 1) represents a vehicle, which with its load weighs one ton, standing upon a grade of ten feet rise in one hundred feet, measured on the road surface. To move the vehicle up the hill, a draft force of two hundred lbs., equal to one-tenth of the weight of the load, must be applied to overcome the resistance of gravity alone, besides an additional amount of draft required to overcome the resistance of friction. If we suppose the vehicle to be moved *down* the hill, gravity tends to *produce* motion with the same force of two hundred lbs. or one-tenth the weight.

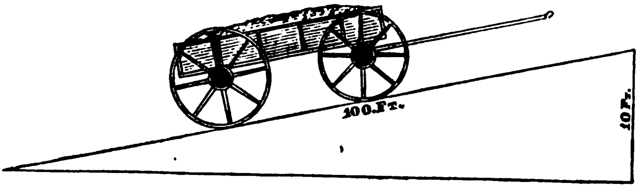

FIG. 1.

If we suppose the same vehicle to stand upon a road of *five* feet rise in one hundred feet measured upon the surface, gravity will act with a force equal to five one-hundredths of the weight, or one hundred lbs., to oppose or cause motion according to the direction in which the vehicle is moved.

The resistance of gravity is the same on all roads of similar grades regardless of the character or condition of their surfaces. The wide difference in the draft required for the same load on different road surfaces of similar grade is due to the other opposing force, *friction*, which will be subsequently considered.

Gravity opposes or aids traction on every road the surface of which rises or falls from level. Its resistance on any given road depends *absolutely* upon the total number of feet of rise and fall throughout, and *relatively* upon the steepness of its grades.

The resistance of gravity on any road can be lessened only by improving its grades. This may be accomplished by cutting down the summits and too high portions of the road, and filling its depressions, or by changing the lay-out so as to secure more favorable natural grades. On existing roads the former course is most practicable unless the lay-out is a very faulty one in this respect.

Grading wisely done, lessens the *absolute* resistance of gravity by lessening the total number of vertical feet of rise or fall, up and down which loads must be drawn. It also lessens the *relative* resistance of gravity by lessening the rate of inclination of excessively steep grades, and by making the necessary rise between two fixed points as nearly uniform as possible throughout.

Roads should never ascend or descend a single foot more than is absolutely necessary. In the ascent of a hill not even the smallest descent should be allowed, if it can be reasonably avoided, as it would increase both the actual rise and the steepness of the hill. Nearly all the roads in sections of the State which are hilly, are more or less faulty as to grades. They might be greatly improved under the direction of a skillful engineer or road-maker at moderate cost.

Prof. Gillespie, in his excellent treatise on "Roads and Railroads," gives the following forcible instances which show how greatly roads may be improved as to grades. A new road built by Telford, in Anglesea, saved twelve hundred and eighty-three vertical feet of rise and fall, or about one-third of the rise and fall on the old road, while the distance between the two places was reduced from twenty-four miles to twenty-two.

On a new road built some years since between Cazenovia and Chittenango, New York, the whole perpendicular rise and fall was only eight hundred feet, the actual difference of level between the two places; whereas the most level road previously connecting them rose twelve hundred feet, and fell four hundred feet, in going from the lower place to the higher. Loads drawn from one place to the other in either direction over the old road, had to rise and fall four hundred vertical feet which by the new road is wholly avoided. The steepest grade on the new road was 1 in 16½ or about 6 in 100.

On the famous Holyhead road built by Telford over the mountainous country of North Wales, there were but two grades steeper than 1 in 30, one of 1 in 22, and another shorter grade of 1 in 17. On the previously existing road the grades had frequently been as steep as 1 in 10, or 1 in 8.

Figure 2 represents the profile of a portion of the principal road between the cities of Middletown and Meriden, Ct. The irregular line represents the present road surface. The connected straight lines show a proposed improvement of the grades. In going from A to B, the present road rises one hundred and six and one-half feet, and falls thirty-six and seven-tenths feet, in the thirty-one hundred feet of distance shown. The proposed grade rises in the same direction eighty and eight-tenths feet, and falls eleven feet. On the road as it is, the steepest grade is 12 in 100. By the proposed grade line, the steepest rise would be only 5 in 100. The deepest cutting necessary to effect these results is only fourteen feet, and the deepest filling eight feet. The proposed grade therefore lessens the *absolute* resistance of gravity one-fourth, and lessens the *relative* resistance of gravity on the steepest grade seven-twelfths.

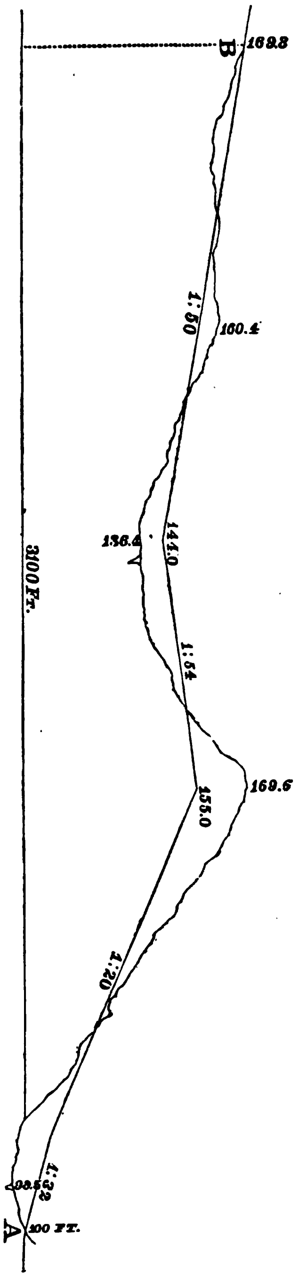

FIG. 2.

Your attention is called, just here, to a very common and serious obstacle to traffic on common roads, namely "water bars" or "breaks," as they are termed. However well made they add to both the total rise and steepness of the road.

Figure 3 will illustrate the increased resistance of gravity which results from the use of bars. The line A B represents a portion of a hill which, without any bars, has a uniform grade of 1 in 10, measured on the surface. The uniform resistance of gravity for each ton of load is two hundred lbs. Suppose six bars to be built as represented, the summit of each being nine inches higher than the previous grade vertically beneath it, and six inches higher than the upper foot of the bar; the length of the lower slope of the bars being fifteen feet. These six bars add three feet to the total rise of the hill, or $\frac{3}{40}$th of its previous vertical rise. They also increase the steepness of those portions of the hill on which they are made, nine inches in fifteen feet, or 1 in 20. Hence they occasion an extra resistance of gravity equal to $\frac{1}{20}$th the weight of the vehicle and its load, or one hundred lbs. for each ton. Three hundred lbs. of draft per ton will be required to overcome the resistance of gravity alone on the ninety feet of bars,—nearly one-fourth the whole length of the hill, whereas without bars the resistance of gravity was only two hundred lbs. Besides thus increasing the resistance of gravity, bars occasion much strain and wear of vehicles and harness, to say nothing of the discomfort of riding over them.

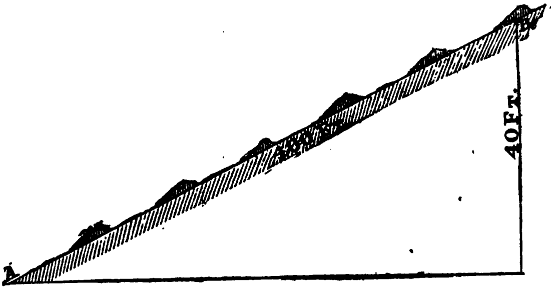

FIG. 3.

The bars we have supposed are not as steep, or as faulty in other respects, as the majority of the bars on our common roads. It must be borne in mind that in the figure their height is exaggerated about five-fold, to make them more apparent to the eye. Bars are commonly constructed as shown in figure 4; and the extra draft they necessitate is greater than has been already shown. That bars may occasion the least possible extra draft, they should not be unnecessarily high, and the road should slope uniformly from the summit of one bar to the upper foot of the next below. Were roads what they should be as to grades, surfaces, and drainage, bars would seldom, if ever, be required. Their use should be much less frequent, and their construction quite different than it is, even with the roads in their present condition.

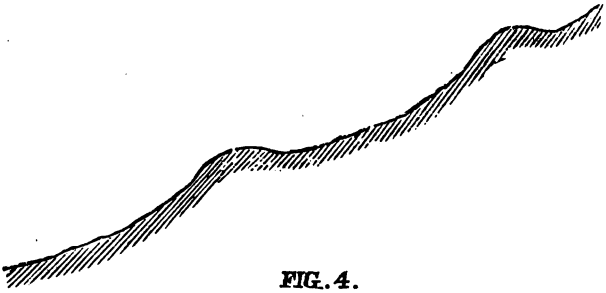

FIG. 4.

The disadvantage of steep grades is even greater than has thus far appeared. According to Emmerson's mechanics, a horse though as strong as five men on a level road, owing to his peculiar structure, on very steep hills has hardly the strength of three men. Gillespie gives the following table deduced from numerous experiments. Calling the load a horse can draw on a level 1.00, on a grade of

1	in	100	he	can	draw	0.90
1	“	50	“	“	“	0.81
1	“	44	“	“	“	0.75
1	“	40	“	“	“	0.72
1	“	30	“	“	“	0.64
1	“	26	“	“	“	0.54
1	“	24	“	“	“	0.50
1	“	20	“	“	“	0.40
1	“	10	“	“	“	0.25

Roads of steep grades are likely to be badly washed by the too great velocity of water in running down their surfaces. They are also dangerous to travel when covered with ice. A steep grade is especially objectionable when it occurs in a long line of road otherwise comparatively level, because the load for the entire road must be limited to what can be drawn up the steep ascent. If a long grade of 1 in 10 occurs on a road having no other grades steeper than 1 in 30, the load must be limited to less than half what can be drawn up the ordinary grades.

Every road should be perfectly level, gravity alone considered, because only such grades wholly eliminate its resistance. This conclusion is somewhat modified, however, by one or more of the following considerations. First, the proper drainage of water from the road surface requires that it should slope slightly both longitudinally and transversely. Secondly, two places are generally at different elevations, in which case the road connecting them could not be of level grade throughout. Thirdly, road improvements are limited by their cost. In sections at all hilly, roads could not be made level or of uniform inclination without far exceeding the limit of reasonable cost. These considerations suggest the importance of determining the proper limits within which, as a general rule, grades should be chosen.

The slope needed to secure proper drainage, where the road could as well be made level, involves a slight resistance of gravity otherwise unnecessary. Hence the minimum slope should be no greater than is required for the purpose it is to serve. An experienced English engineer has assumed 1 in 80, or sixty-six feet per mile as the proper minimum grade, while the French government board of engineers of roads and bridges, established for their roads a minimum grade of 1 in 125, or forty-two feet per mile. The more perfect the surface the less the grade required to afford drainage. It may be assumed that roads should never have a grade less than 1 in 125.

The steepest grade of roads should not exceed what is termed the "angle of repose." On such a grade the force of *gravity* to cause motion, is just balanced by the force of *friction* to oppose it. On such a grade a wagon or cart will stand at rest. Heavy loads may be drawn down such grades without crowding upon the horses. Accidents would occur less frequently and would be less serious, if roads were no steeper than this.

In ascending such a grade, gravity and friction both oppose traction with equal force, and the draft is just double that required on a level grade. Horses are capable of exerting double their ordinary working power for a moderate length of time, and for a shorter time even more than that. We may therefore assume the grade which equals the angle of repose as the *maximum* grade of roads. Grades which must be steeper, should be considered exceptions to the rule. The maximum grade on loose gravel roads is about 1 in 16; on common earth roads in good condition, about 1 in 20; on the best Telford road about 1 in 50.

Gravity indirectly opposes traffic on roads of much convexity or cross-slope, by tending to make the vehicle slide sidewise toward the gutter. The vehicle is usually kept in its proper place by an extra amount of friction between the wheels and the road surface, which thus adds somewhat to the draft required. This tendency of gravity on the sloping sides of roads is seen when they are covered with ice, in the slewing of vehicles upon them. Roads should have no more transverse slope than is requisite for good drainage.

The best cross section for a road is one formed by two planes rising slightly from the sides toward the center, connected by a slight curve as shown by figure 5.

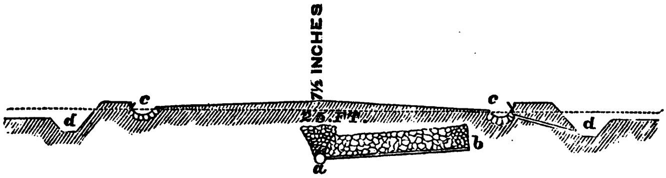

FIG. 5.

The cross-slope of earth roads should seldom exceed 1 in 20. Telford adopted for broken stone roads a slope of 1 in 30. McAdam gave to his roads a cross-slope of 1 in 36, and in some cases only 1 in 60.

The cross section most generally adopted among our roadmakers conforms nearly to the segment of a circle, or a flat semi-ellipse. It is generally supposed that rounding up the road in this way secures good drainage. It will be seen, however, that drainage alone considered, this form is objectionable. Even with this extreme roundness, the center of the road is too flat to allow the water to run off properly, while the

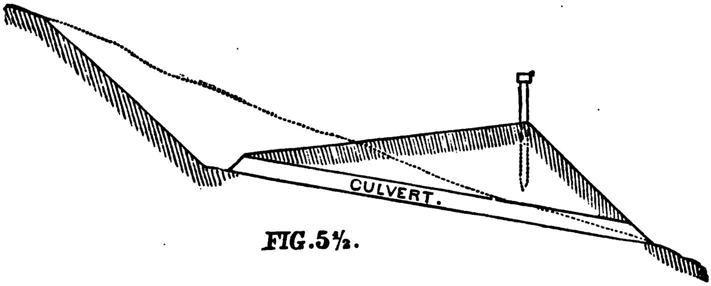

FIG. 5½.

sides are so steep as to be badly gullied by water in running off them. Teams invariably follow the summit of such a road, the sides being unsafe and uncomfortable to ride upon. This depresses still more the already too flat part of the road, so that the water falling on the center of the road must run along the tracks of the wheels and horses until turned off by bars or

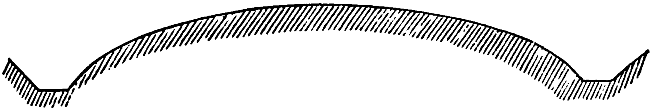

FIG. 6.

other means into the gutters. Much of the damage of roads by water is the consequence of a faulty construction as regards their cross-section. If roads slope moderately and uniformly toward the gutters, water will drain off properly from the entire surface without any considerable damage to the road. Teams travel with equal ease and safety on every part of such a road. Travel may be uniformly distributed over the whole surface of the road which would prevent the forming of ruts, and consequently much of the damage caused by water. As to drainage therefore, extreme convexity defeats the very purpose it is supposed to serve.

On a convex road nearly all the wear of travel, as we have already seen, is borne by three narrow portions of the road, the tracks of the wheels and horses, in all not more than one-fourth or one-third the width of the roadway proper. The rest of the road is practically useless, except that it affords room for teams to pass each other, and for turning about. Such roads require much more frequent and extensive repairs than roads of moderate and uniform cross-slopes, owing to the unequal wear of their surfaces by travel.

Thus far we have considered the force of *gravity* as it affects traction on common roads, and what the grades and cross-section of the latter should be with reference to the same in connection with drainage and other considerations. Let us now consider somewhat briefly the other opposing force.

FRICTION.

The resistance of *gravity*, as we have seen, depends entirely upon the inclination of the road regardless of the kind or condition of its surface. The resistance of *friction*, on the contrary, depends upon the character and state of the road surface, independently of its grades. The friction which opposes traction is generated partly at the axles, but mainly between the rims of the wheels and the road. It will be herein considered as occasioned entirely by the road surface.

Friction is caused by the wheels bearing upon and displacing the particles of the road surface, and by these particles rubbing against and displacing others, and so on. The more the particles of the road surface are displaced and the harder they rub against each other, the greater the friction produced. Hence roads to present the least frictional resistance to traction should be as permanently hard and smooth, under the varying conditions of traffic and climate, as is possible.

Many excellent kinds of road surface are now in use, the principal of which are stone trackways, stone pavements, wooden pavements, asphalt and concrete pavements, broken stone surfaces and gravel surfaces, all of which except the last two kinds are too costly for country roads.

The resistance of friction is too variable to be mathematically determined. It may be found for any road by measuring the draft required on a *level grade* with a dynamometer, the instrument used for testing the draft of mowing machines; or, by finding by experiment the grade equal to the "angle of repose," from which we may calculate the resistance of *gravity*, to which on such a grade the resistance of *friction* is always equal. The mean result of several experiments on any particular kind of road, will show with sufficient accuracy for practical purposes the frictional resistance of such a road surface. The following table taken from Gillespie's "Roads and Railroads," gives the frictional resistance of each of the various road surfaces named, obtained from experiments made with a dynamometer, the load in each case weighing, including the vehicle used, twenty-one hundred lbs.

	draft.			
On a gravel road laid on earth	147 lbs.	= $\frac{1}{16}$	weight of	load.
" broken stone road "	65 "	= $\frac{1}{36}$	"	"
" " " " on paved bottom	46 "	= $\frac{1}{51}$	"	"
" well made pavement,	33 "	= $\frac{1}{71}$	"	"
" best stone trackway, per gross ton,	12½ "	= $\frac{1}{179}$	"	"
" best steel railway,	8 "	= $\frac{1}{280}$	"	"

Broken stone roads are of two kinds, named respectively from the engineers who devised and introduced them, McAdam and Telford roads. Their main difference consists in a pavement of rough stones beneath the broken stone surface of the Telford road.

The stone for the surface of either should be both hard and tough, and should be broken so as to pass through a ring two and one-half inches in diameter. Basaltic or trap rocks are the best; sienite or granite, next; limestones next. Sand stones, if soft, and clayey stones should never be used for roads. The thickness of a McAdam road, which is made wholly of broken stone, should be from six to twelve inches, according to the amount of traffic, and the nature of the roadbed. The road should be first suitably graded, and properly arranged to secure good drainage, after which the stone may be applied in layers not exceeding three inches in thickness. Each layer should be somewhat compacted with a heavy roller, or by travel, before the succeeding layer is applied.

Figure 7 represents the section of a McAdam road.

The Telford road consists of a pavement of rough stones set on their broadest edges or ends, lengthwise across the street.

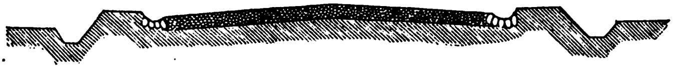

FIG. 7.
McADAM ROAD.

The thickness of this pavement should be from seven to nine inches at the center, and from three to six inches at the sides. Fragments of hard stone should be wedged into the openings on the top of the pavement, with a light hammer, after which the tops of stones projecting above the general surface should be broken off. The broken stone may then be applied as on the McAdam road, but need not be as thick, six inches bein ample for country roads.

Figure 8 shows the section of a Telford road.

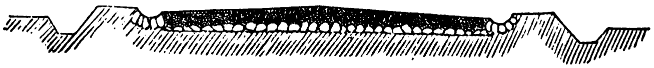

FIG. 8.
TELFORD ROAD.

Of the two, Telford roads are generally considered by engineers and intelligent road-makers the better. The Telford pavement makes a firmer and more durable road, and prevents the earth beneath, softened by receding frosts or otherwise, from pressing up among the broken stone. It also affords a kind of under-drainage, and allows the use of larger and less expensive stone in the bottom of the road.

The leading principles regarding broken stone road surfaces are, first, that stone must be somewhat broken into angular fragments before they can be firmly compacted together; secondly, that only small stone should be used near the surface of the road, as the force of wheels or the hoofs of horses striking eccentrically upon a large stone would loosen it, and the smaller stones about it from their places, thus preventing the road from becoming solidly compacted together.

A Telford road twenty-five feet wide, properly constructed, would cost from twelve to twenty dollars per rod, unless the stone were near at hand, and somewhat broken. This comparatively large cost will prevent their being brought at once into extensive use for country roads. The Telford road may be used with great advantage for those portions of highways which are frequently sloughy and difficult, even before they are adopted for extensive use, on long sections of roads. Since broken stone roads are necessarily quite expensive, no thoroughness should be wanting in their construction. The maxim "What is worth doing at all is worth doing well," is especially true in the construction of broken stone roads.

The most perfectly constructed gravel roads are made by applying screened gravel upon the natural surface, after having first made suitable provision for under-drainage. The gravel should be applied in layers one or two inches thick, each layer being thoroughly imbedded by a heavy roller before the next is applied. The use of a heavy roller in constructing and repairing common earth roads would promote both the durability of the roads, and the ease and comfort of travel.

The gravel generally used on roads has too great a mixture of sand and earth in it to produce the best results. The poorest gravel is much better, however, than the clods, soil, and worn-out material, which are so universally and indiscriminately scraped upon the road from the gutters. Gravel should be used much more extensively in repairing roads, especially in sections where it is abundant and of good quality, until roads of better material can be afforded.

The resistance of friction on a road is greatly increased, and its durability much impaired, by excessive moisture. This is especially true of roads of natural earth surface. Some means of preventing, and of removing, any excess of water are of great importance, especially where the earth is of a clayey nature, or otherwise retentive of moisture.

We have already fixed upon the slopes roads should have, that water may drain readily from their surfaces. There should also be suitable gutters and ditches at the sides of the road, to conduct away the water which runs off its surface. The road should, at the same time, be so constructed, that no water can possibly run upon it from the roadsides or adjoining fields.

On most of the roads of our State, the gutters and side ditches are one and the same thing. Most road-makers seem to regard them merely as pits from which the material for road repairs is to be taken. Often the stones and rubbish culled out in leveling off the road, are thrown right back again into the gutters, there to remain until again scraped upon the road.

It is seldom that any pains are taken to leave the gutters well cleaned out, with a good descent so that water will flow along them freely. They are frequently left as pond holes, which collect and hold the water that drains off the road, until it becomes absorbed by the ground beneath it and at its sides. The gutters should always be kept unobstructed, and, at moderate distances apart, there should be open ditches leading from them into the fields, or otherwise away from the side of the road.

If the surface of any road is to be thoroughly and systematically improved, such an arrangement of gutters and side ditches as is shown in figures 5, 7, and 8, is recommended. On each side of the road-way is a shallow gutter, paved with hard, roundish stones. Outside each gutter is a mound, or shoulder, from four to six feet wide, about eight inches higher than, and sloping slightly toward, the gutter. At the foot of the outer slope of each mound, is a side ditch of sufficient size and fall to carry off readily all the water it may receive. At distances apart of two or three hundred feet, channels or culverts should be made across the mounds to lead the water from the gutters into the side ditches, which should be paved, or otherwise protected from being injured by the water. One of these mounds may be graveled, for a foot-path, while the other will afford storage room for broken stone or gravel, for use upon the road. They also keep the water from running over the gutters and gullying the side-slopes of the road, and serve as a guard against driving off the road in the night. They protect the road somewhat from severe frosts, and on Telford or McAdam roads, make firm shoulders against which the broken stone may rest.

The surfaces of roads should be raised at least fifteen inches above the level of the ground at the sides, and should be not less than two and one-half feet above the bottom of the gutters. This would facilitate drainage, and prevent water from the road-sides from running upon and along the roads when the gutters become obstructed with snow and ice. Roads thus raised would be more favorably exposed to the action of the sun and wind, and would sooner become dry after rains and thaws.

Good culverts should be built where the road is crossed by small streams, and where otherwise water would sometimes collect on the upper side of the road. These should always be sufficiently deep, and of ample size, to afford a ready passage for all the water of the heaviest rains. They are usually made by laying two parallel walls of stone and covering them with heavy, flat stones or plank. They are seldom properly constructed, and in most cases require building over every three or four years.

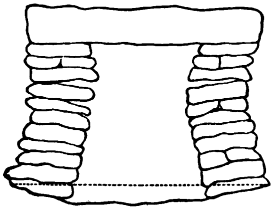

FIG. 9.

Figure 9 represents the cross-section of a culvert, showing the results of faulty construction.

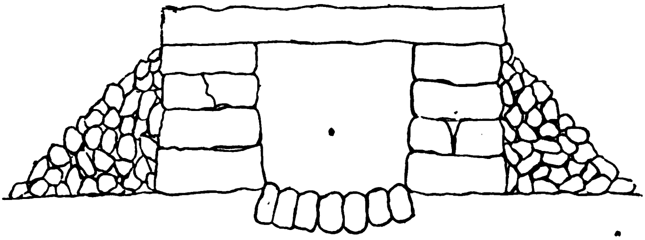

FIG. 10.

Figure 10 represents the cross-section of a similar culvert properly built. If the bottom of a culvert is of earth, the water will after a time undermine the walls, causing them to settle and fall inward. If the walls are light and of too small stone, the frosts pressing against them from behind will have the same tendency to overturn them toward the center of the culvert. The bottoms of culverts should be paved, as in figure 10, or protected in some other equally good way. Their side walls should be of solid, good-sized stone, and never less than two feet thick. If liable to injury from frost, a backing of field stone should be placed behind the walls, as shown in the figure. If the covering is of large, flat stones, they should be cramped together with irons, or two courses of stone should be used, breaking joints with each other. Plank are objectionable as a covering for culverts. Where large, flat stone cannot be easily obtained, the culverts may be arched with brick or stone. A very good culvert for a small stream is made by building a semi-circular arch of brick-work, of three feet diameter, upon two rows of solid footing stones, and paving the bottom as in figure 10.

In no way can roads on naturally wet, heavy soil, be so greatly improved at moderate cost as by *under-drainage*. This is best effected by laying a drain of stone and tile, or of stone alone, along the center of the road, as represented in cross-section on figure 5, at *a*. If the road is very wide, or if the ground is very wet or springy, branch drains should be laid at an angle with the main drain, of about seventy five degrees. (The longitudinal section of such a drain is shown by *a*, *b*, in figure 5.) Drains for roads should be somewhat differently constructed than for agricultural purposes, owing to the compactness of the road-bed, and the importance of removing the water as speedily as possible. The drains should have a good descent, and should discharge into culverts, or at some sufficiently low point outside the road. There are a few other considerations relating to the previously mentioned forces in common, or not belonging properly to either, to two or three of which we will briefly allude.

Roads should never be *unnecessarily long*. Every foot of needless length involves a threefold waste: first, of original cost; secondly, of expense for repairs; and, thirdly, of time and labor required in traveling over it. The chief end to be sought in road-making, as has previously been stated, is the least possible resistance to traction, rather than shortness of distance. It should also be borne in mind that the length of a road is the length measured upon its surface, and not the horizontal distance between its ends.

These facts seem not to have occurred to the persons under whose direction our existing roads were projected. They have generally been laid out in straight lines, regardless of hills. The ancient Romans so built their otherwise excellent roads, traces of which still remain. Every one knows that a bail is no longer when it lies on the edge of a pail than when it stands upright, and that the distance around a hemisphere between two opposite points, is no greater than the distance over it; but few persons see the force of these facts with reference to roads. A road around a hill is sometimes no longer than one over its summit, while the length of the former seldom exceeds that of the latter as greatly as might be supposed. How much the length of a road may be increased, to avoid a vertical foot of rise, depends mainly upon the character and amount of traffic over it, and upon the frictional resistance of its surface. As a general rule the length of roads which are to have considerable traffic may be increased twenty feet, and roads of ordinary use, ten feet, for every vertical foot of rise that can be thus avoided. A road around a hill should usually be laid out in such curves that the proper grade for the center line of the road shall lie approximately in the surface of the ground, instead of being in straight courses. Roads on hill-sides should be of such a cross section as is shown in figure 5½.

A road should not be *unnecessarily wide*, as every needless foot of width adds nearly one-eighth of an acre per mile to its area, and increases proportionately its original cost, besides adding somewhat to the expense of keeping it in repair. Outside of cities and villages, twenty-five feet is sufficient for the width of roads of the most traffic. Roads of ordinary travel should be about twenty feet wide. For others of still less travel, fifteen feet is ample width.

Whether any proposed roadway improvement should be made or not, depends finally upon the ratio between the annual interest of its cost, and the yearly benefit to traffic to result therefrom. When such benefit exceeds the interest of the cost, the proposed improvement may be made. If the annual benefit to be derived from any proposed improvement of the road is *less* than the interest of its cost, the improvement should be made less extensive, until the benefit to result from it will exceed the interest of its cost. If this can not be done, the plan must be abandoned. Great care should be exercised to guard against any error which would result from prejudice in favor of the improvement. If any doubt exists, the advantage of the doubt should be *against* making the improvement, that the estimate may be relied upon, if in its favor.

A few brief suggestions will be made in conclusion, as to the measures to be adopted for the improvement of roads.

And first, the system of maintaining the roads by a highway tax, to be worked out under the direction of a "highway surveyor," should at once be discontinued, and some better method adopted. Better material should be used on roads, and repairs should be made in a more perfect manner. Extensive repairs should never be made late in the season. Abrupt irregularities of grade, and sudden deviations from the general course of the road should be avoided and corrected, as far as possible, in making repairs. A heavy roller should be used in constructing and repairing roads. Such an instrument would make the road much harder and smoother, and much more durable. Wet pieces of road should be thoroughly drained. Roads should receive more careful attention before and during heavy rains and thaws, that damage by water may be prevented. "A stitch in time saves nine."

Secondly: towns should also expend something each year for *permanent* roadway improvements. The amount thus annually expended need not be large. As a rule improvements should be made no faster than they can be paid for by a reasonable rate of taxation. A difficult hill may be graded one year. A wet and miry piece of road may be drained and

Telfordized, or otherwise improved the next year, and so on. The most difficult sections of the most traveled roads should be improved first. The improvement of sections here and there on a road, should always be made in conformity to some advantageous and well-considered plan for the whole. No part of the road should be Telfordized or McAdamized until its surface has been properly graded, as considered by itself and with reference to adjoining sections.

Every intelligent citizen, who appreciates the advantages of good roads, should encourage roadway improvements. Let a leading farmer enlist his neighbors for two or three days work with men and teams in grading some difficult hill, or in draining and otherwise improving some miry piece of road. Such an effort will do much toward awakening an interest in such improvements. The clergyman, the doctor, the lawyer, and other men of culture and influence, owe it to their fellow-townsmen whose advantages for acquiring knowledge have been more limited than their own, to inform them, as they may have opportunity, concerning the principles of science which have to do with their daily avocations, their health, and the institutions upon which their welfare and happiness depend. It is the duty of such persons to interest themselves in the common roads. The town, as a political unit, is ordinarily responsible for but two things,—the care of its poor and the maintenance and improvement of its roads. The system by which roads are repaired and the measures taken for their permanent improvement, really depend upon a few of the more intelligent and influential citizens of the town. The ladies may do much to encourage and promote the improvement of roads. In several towns and villages of this State the ladies are organized and working to raise funds for building walks, planting trees, and erecting lights upon the streets. Let them also stir up their husbands and brothers to do something to improve the roads.

Agricultural societies should also recognize the importance of improving the roads. Let them offer a premium of a few dollars' worth of books on road-making, or some kindred subject, to the town keeping its roads in the most perfect repair during the year; also, to the town making the greatest amount of permanent improvement on its roads, and the like. This would be perfectly consistent with their partiality for the *horse*.

The press should also give subjects concerning roads a generous place in its columns, especially if its issues have a large circulation in country towns. If its aim is to enlighten and instruct its readers, it can find few subjects concerning which there is a more general lack of information at present than this.

The great need, to begin with, is a better appreciation of the value and importance of good roads; of the defective condition of the roads which now exist, and of the great advantages which would result from the judicious expenditure of a moderate amount of money every year, for permanent roadway improvements.

Mr. N. HART. I would like to inquire whether the height of the wheel makes any difference in the amount of friction to be overcome?

Mr. AUGUR. It does. The higher the wheels are, within certain limits, the less friction there will be; or rather, it makes no difference in the friction, but the leverage is increased, and the friction is more easily overcome. When the line of draft becomes parallel with the road surface, it is a disadvantage to raise the wheels any higher. Where the fore wheels of the wagon are so low that the line of draft is very much out of parallel with the level or the grade of the road, the horse has to lift a certain portion of the weight that rests upon the fore wheels, in addition to moving it, so that, with such vehicles, it is better that the load should be over the hind axletree.

Mr. SEDGWICK, of Cornwall. Does the size of the axle make any difference?

Mr. AUGUR. Yes, sir. There will be less friction on a small axle than on a large one.

Mr. MOORE. I would inquire whether the plans shown are designed for double roads?

Mr. AUGUR. They are designed for roads twenty-five feet wide, which would allow at least three vehicles to run abreast.

Mr. MOORE. Do you mean to have a track on each side of the center?

Mr. AUGUR. I recommend that there be no particular track at all. Every precaution should be taken to have every part of the road, as nearly as possible, equally traveled; and that is the reason why it is better to have some man employed on the road all the year round, so that he may, every time he finds the road working into ruts, go and fill them up, and make them just as high as the other parts of the road, and thus divert the travel to some other part. There should be no ruts at all. A good road should be traveled equally over all its parts.

Mr. CHEEVER. What would you say about the width of tire for heavy loads?

Mr. AUGUR. On common earth roads, or on level roads, where the road is compressible, the width of the tire should be increased beyond what it is now. The friction would be lessened about in proportion as you make the tire of the wheel wider. That is, if you have a tire two inches wide, with a draft, for instance, of five hundred pounds to a ton, if you make it four inches wide, the friction will be only about one-half.

Mr. N. HART. Would you not have a greater resistance, which would be as deleterious as the greater amount of friction you got with the narrower tire?

Mr. AUGUR. Let me refer to an authority on this subject. I will read a paragraph from Gillespie on "Roads and Railroads:" "The imperfect surface of an earth road makes it doubly important to take every precaution to lessen the friction of vehicles upon it. The resistance decreases as the breadth of the tire increases, on compressible roads, as earth, sand, gravel, etc., while on paved and broken stone roads the resistance is entirely independent of the breadth of the tire."

Mr. H. B. PECK, of Northfield. Is there any advantage in having a brake attached to the wagon, applied back of the hind wheels?

Mr. AUGUR. I do not think of any advantage in it now. The action of the break in easing loads down hill, is simply this: it increases the friction of the vehicle or of the road. Now, if the break holds the wheel fast, then the friction at the road surface is increased. If, however, the wheel rolls round on the break, the friction is more between the wheel and the break. The leverage being the same, I see no practical advantage in placing the break behind, unless it is to lessen the strain on the vehicle.

Mr. H. B. PECK. Is the weight on the axle relieved by having the break behind?

Mr. AUGUR. No, sir, I think not. It would be a good deal like a man attempting to lift himself by his boot-straps. I am not quite positive as to that, but I think there would be no less weight on the axle.

Mr. GOLD. One of the questions in the box is about roads: "Can any better method be devised to turn water off of roads running over steep hills than 'Indian graves,' as they are sometimes called, or water bars, or ridges extending across the road?" We get a new name for these things here.

Mr. AUGUR. I am very glad that question has been asked, because I am afraid, in making up my paper, I neglected to say as much on that subject as I should like to have said. I think I said I would try to show that bars were nearly, if not wholly, unnecessary on roads. If the surface of a road is made with a uniform slope from the crown towards the gutters, and if the slope of the road can be perfectly preserved, the water will run off on each side from the center of the road. But if ruts are worn in the center of the road, the water will run in those ruts. If you can prevent ruts being formed, there will be no occasion for any bars at all. Very often, bars are constructed square across the road; in other cases, the bars are made obliquely across; both of which forms are very objectionable. On the latter, one wheel strikes the bar and rises before the other, and the tendency is to throw the weight on the opposite side. About the time that wheel gets over the bar, the other wheel strikes it, altogether causing great strain. By the way, the strain from bars causes three-quarters of the breaking of bolts and whiffletrees and traces that occurs. First, the momentum of the vehicle is suddenly checked, and, as the horse keeps going, the bolt, or the whiffletree, or something else breaks. The better way would be to make the bar in the form of an inverted V, just as slight as possible. It should be of stone, or something of that sort, so that when heavy vehicles are going over it, they shall not cut channels through it. If you make a bar, make it of stone or cover it with good hard gravel. If you cannot stone the whole road, it will pay to stone a little piece here and there, for the sake of turning the water off.

Mr. GOLD. The question has been asked me whether bars could not be made of stone on our common roads. Two weeks ago I was at Haverhill, in Massachusetts, and visited the farm of Dr. Nichols, the editor of the Journal of Chemistry. He reaches his country seat by a road which ascends a long hill, as steep as any of our New England hills, and I noticed that there were no bars, in the shape in which we make them, upon that road. But there were hollows, laid with stone, shaped like an inverted V, for the purpose of turning the water off. The two wheels of the wagon, if driven in the middle of the road, would strike in this semi-hollow at the same time, and would not rack the wagon at all, and yet these hollows seemed to answer the purpose admirably. I brought home a new idea, and calculate to put it in practice. They were laid with cobble-stone, some half-dozen inches in diameter. A slight depression, laid with stone, instead of an elevation, and it seemed, in that case, to be answering an excellent purpose.

Mr. RICHARD GOODMAN, of Lenox, Mass. How deep were they laid?

Mr. GOLD. A few inches only below the grade.

Mr. HIRAM SAGE, of Colebrook. In making bars, do not folks ruin their calculations sometimes by not filling up sufficiently below, making them too steep to pass over comfortably.

Mr. AUGUR. Undoubtedly. The best way to make them, if they must be made at all, would be to make them incline from one bar to the foot of the next one. But on a good road, even of common earth, bars are much less necessary than would be supposed. Part of the road between Meriden and Middletown has been recently improved, and on the whole section, which is of natural earth, there is not a bar; and yet you will seldom find a puddle of water in it, or any water running for any great distance upon it.

Mr. SAGE. I wish to inquire what you consider the best form for country roads; I mean, such roads as our people have to use in going ten or fifteen miles from home, through ground that is somewhat stony, and the soil muddy and soft in the spring?

Mr. AUGUR. I should recommend in the first place that some means of drainage be adopted. A road is seldom so situated that it cannot be drained. The difficulty with most roads of this kind is, that they are too wet. Then, if the soil is of such a character that it will not make a tolerably hard, compact surface of itself, Telfordize or macadamize the road with trap-rock, granite, or field stone. I meant to have said, that field stones may be used for the bottom of a Telford road; but if you cannot afford trap-rock, field stone, or granite, put on gravel.

Mr. SAGE. I have thought of a plan to improve a piece of wet, moist road, where it is difficult to trench. Begin at one end and scrape out the dirt for twenty feet, and then lay a bottom of stone, and then put some material on top, as small brush, or anything of that kind, and then take another piece of twenty feet and scrape all the dirt from that which is suitable, on to the first section, and lay the bottom with stone in the same way, and so on through the whole piece. Would not that make a good road?

Mr. AUGUR. The soil of a wet road is very apt to be muck or clay, and neither of these is very suitable material for a road. And as for brush, it may be very good at first, but it will not last. Some people think sod will make a good road, but it soon becomes rotten and tender, and the wheels cut through.

Mr. SAGE. After that is done, would it not be a good plan to put on gravel?

Mr. AUGUR. Yes, sir, I think it would.

Mr. MOORE. The first thing to do in making a road is to get out the water. You may fill in as many stones and as much dirt as you please, but after all, water will find its way up, by capillary attraction, as they call it. I have seen one instance where the water was got rid of by digging a hole clear through the hard-pan, down to what geologists call the water-table, and then filling up the hole with loose stones. In some localities that will take away a large amount of water; perhaps take the whole of it away.

Mr. WEST, of Columbia. I believe such places as have been alluded to may be remedied by filling in small stones, so that wheels cannot cut through. I would recommend that the stones be broken with a hammer. I have seen some places, three, four, or six rods long, where small stones were filled in, making a bed six, ten, or twelve inches deep, and then covered with good earth. In that way a road can be made that will remain for years, with nothing more than ordinary repairs. It is the best way I have been able to find to repair such places.

Mr. SAGE. I refer to roads that have never been cleared from the bottom, where the stones are always working up.

Mr. WEST. Dig out the road, fill in the stones, and cover them up.

Mr. MOORE. The best way is to dig a hole, and let the water go straight down.

Mr. PECK. Do you recommend different widths in the gauge of our vehicles for the purpose of avoiding ruts?

Mr. AUGUR. I have not thought particularly on that subject, but I should say not. I think some other means should be taken than that. Wherever there are ruts, there is a great deal of strain on the wheels, tracking differently unless the gauge differs very much.

Mr. T. L. **Hart.** How would it do to make the whiffletree longer, so as to get the horse directly in front of the wheel-rut?

Mr. **Augur.** I do not see that there would be any particular gain in that.

Mr. **Gold.** The horse would tread the earth in, and fill up the rut.

Mr. **Augur.** After the ruts are made, the more they are tracked up by the hoofs of horses, the more they are worn by water.

Hon. **Richard Goodman**, of Lenox, Mass. I am glad that this discussion has taken place. This is a subject, like a great many others that are announced to come before this meeting, that does not, perhaps, appeal quite so directly to the public mind, or the individual purse, as the questions presented at your former meetings, and therefore I was fearful that not so much interest would be taken in it. But as citizens, interested in the prosperity of the State in which we live, and in that of the whole country, no more important subject could be brought forward for our consideration than this, and it has been as well treated in this lecture as we could expect to have it.

The great difficulty, as it strikes me, in regard to the construction of roads in this country, as in many other things, has been, that we have been trying to make them in a hurry. It is not a thing to be done in a day. It has not been done anywhere else in a day. Men who have been abroad sometimes come home and complain of our roads, after having seen the fine roads in England, and on the continent, forgetting that we, as a nation, are only a hundred years old, and ought not to be compared with a nation a thousand years old. The fact is, that road-making in England is comparatively a new thing. It is not more than two hundred years since they were in just about the same sloughs, that we were in a hundred years ago. At that time, it was just as difficult to go from Manchester to London, as it is now to travel in any part of the west upon the roads. The only way to make the journey was on horseback, or on pack-wagons. You all remember the phrase, "Hobson's choice." It originated in this wise. A man by the name of Hobson, who kept horses for hire, gave every customer the horse that stood nearest the stable door, when he called for one; he could take that horse or none. It is only within the last two hundred years that they have been able to McAdamize or Telfordize their roads. They have a territory not much larger than one of our States, and they have had population enough to repair their roads, employing children, as they do sometimes, upon them. We have no children to spare for that purpose. We want them at school, or in factories, and will not set them at work on the roads. Our railroads have, in great measure, superseded the necessity for those turnpikes which existed in former times, between the large cities and the capital. But it is important that in country places we should have good roads. They are like the arteries and veins in the human system, through which the blood circulates. The great difficulty is, that they are made for a temporary purpose. Take a road from one country town to another, and the amount annually expended upon it is substantially lost. You will find, in every part of this State, roads which are frequently traveled, which are not a great deal better to-day than they were fifty years ago. The difficulty is, we waste money from year to year, and get no better roads. The suggestion of the lecturer in regard to providing for the permanent improvement of roads, is one we should bear in mind. Take a road between two places, six miles apart. Three or four hundred dollars are spent every year in repairing it. This repair is, of course, under our present system, only a temporary one. We do not put any stone anywhere. We do nothing more than plow up the soil on the side of the road and put it in the center, which makes the very worst road in the world. It is just as muddy one spring as another. Now the true way is the one suggested by the lecturer,—that every year, the towns between which these roads run, should make a permanent improvement, each at its own end. Suppose each town begins at its own end, and McAdamizes or Telfordizes (whatever system they may adopt,) one mile of road. Suppose the towns are ten miles apart, in five years those two towns have made a permanent road,—assuming that they have drained it, and built it properly,—which, with very slight expense, will last a generation, and perhaps for ever. They will have no occasion thereafter to spend four or five hundred dollars a year on that road. An outlay of one hundred dollars a year will keep it in good condition, and make a road over which people can drive, not only in the winter and summer, but in the spring. I do not know how it is with you,—the different parts of the country differ in this respect,—but I guess the mud is as deep around Hartford and Wethersfield as anywhere. With us, it is almost impossible for people to get through it in spring. And that is the case all over the country. The only way that occurs to me to remedy the difficulty is to carry out the suggestion of the lecturer in reference to the adoption of a system looking to the permanent improvement of the roads.

Another thing. The system of allowing people to work out their taxes on the road, is probably the worst we ever had. We abolished it in Massachusetts, luckily, in 1871, so that there is now no working out of taxes on the road in that State, but there is a money tax. Commissioners are appointed who have charge of the roads, and as only one goes out every year, there is always one kept in who knows something about it. But that system is not perfect. The system in vogue in England is a great deal better than that. There the parishes make the roads; they are liable for all accidents; they elect a surveyor, and that surveyor is obliged to perform his duty; he is answerable to the highest authority of the kingdom. We shall have to adopt a similar system in this country, before we shall have perfect roads. The legislature will have to perfect a system of road-making, and appoint commissioners to superintend the work done by the surveyors elected or appointed, in the various counties. When we get that system fairly established, we shall begin to have good roads.

I understand that there is a worse system here than that of working out the taxes, that is, of letting the roads out for three or five years to the lowest bidder. All experience is against any system like that. In the time of Louis XIV, in France, there was established what was called the Corveè system, which was exactly like our old system, in which men who did not understand the business worked the roads. When Turgot, his great Minister, came in, he investigated that subject, and found that the expense of working the roads was three times as much as where it was done by raising a money tax and employing competent men to perform the work. Therefore I say we shall never get good roads until we adopt the system of raising the money for the work by taxation and putting in competent men to see that the work is well and thoroughly done. When we arrive at that, when we have a State Superintendent, and have some authority to compel the towns to make permanent and good roads every year, as suggested here, instead of temporary and bad roads, we shall probably have good turnpikes, and not until then.

Mr. AVERY, of Groton. There is one great obstacle to carrying out the ideas which have been presented here by Mr. Augur in his address. In the town where I am acquainted, the practical difficulty has been the expense involved. All would like good roads, but the trouble is, they cost too much. Now, here is an idea in that connection which seems to me to be of importance. People are continually changing their locations, of course. No one is so fixed in his position but what he may change it. There are always strangers coming into our towns. There was a question came up in the Legislature of 1865, and the fact was ascertained, that in some of the shore towns, particularly between New Haven and New York, more taxes were paid by those who had come into those localities than by the original inhabitants. In New London, Groton, Stonington, and all those shore towns, a large amount of the taxes is paid by those who have come in from other places. Now, one of the first questions, when a stranger comes into town is, "How are your roads? Are they pretty good, or are they almost impassible?" It seems to me that that is a consideration which ought to have weight with our tax-payers. A man says, "I would like a good road but I am not willing to pay for it." But suppose by making a good road, some wealthy man is induced to come into the town, he may get, not seven per cent. only for his money, but fifteen or twenty per cent. A road was contemplated from the village of Mystic, down to Niantic, where there were a few houses, occupied by some smackmen, carrying on their business, and the town of Groton was so unwise as to fight it, at an expense of some four thousand dollars, and it cost $1,500 to build the road. There were only some six or eight houses down there at that time, and now there is more than a million dollars of taxable property there, two churches, and a flourishing village, which has grown up out of that enterprise. We had the same experience on the other side of the town, we had to fight there four years to get a road, and we had a taxable property of over $100,000 at the time. Still the town fought us four years. It cost somewhere between three and four thousand dollars to build the road there, and it cost ten thousand dollars to fight it. The fight was more expensive than the road.

The first thing for any locality is to get good roads, I do not care if it is a farming locality, for the first question a man asks, if he is going to buy a farm, is, "what are the roads in that town?" We started an enterprise around the Pequot, below New London, some years ago, and the city of New London voted eight thousand dollars to put a nice street through, and do it right up, so that there should not be any trouble about it in the future. It is the nicest place to trot a horse there is anywhere, for about three miles. They expended eight thousand dollars, and put the road through to the Pequot House. That was the first house built, there was not much property there then, and they carried this road down to that house. The result has been, as I am informed by one of the most intelligent men in New London, that there is probably more than two millions of taxable property in the immediate vicinity of the Pequot House, and last winter there were some ten or twelve cottages, costing four or five thousand dollars apiece, built immediately in the vicinity of that house.

Now, gentlemen, the fact is this, although it may cost you something to get good roads, it is one of the best investments you can make, and any man who is going to a locality, whether as a gentleman of leisure or as a man of business, whether he wants to buy a farm to improve, or to sell for building lots, one of the first things he will ask will be, "Have you got good roads?" There is no question about it at all in my mind.

Mr. P. M. Augur. As a single illustration of the advantage of making these permanent improvements, I want to mention a case. Between my house and the city of Middletown, during the past year, there has been an improvement made of this character. There were two streams, crossed by two bridges, about ten rods apart. Between those two bridges was a depression of from four to six feet, which of course had to be descended by any team going either way. That road has probably been traveled from 150 to 200 years. This year, a true grade has been made between those two places, and the question is not whether that improvement is equal to the interest of the money, but whether that improvement is not equal to the whole cost, in a single year? I believe it is; I believe it can be proved that it is. I know that it is. And when we reckon the amount of travel, which is very great over that road, it will easily be seen that that amount will be saved for all future time; consequently, the advantage is very great. I believe that in every town in the State there are instances where an outlay of perhaps two or three hundred dollars would effect an improvement which would be so marked that it would lead to other improvements in the same direction, by which we should be vastly benefited.

Mr. Gold. I think this is a pretty good place to talk over the subject of roads. I remember coming over here, some twenty-five years ago, and going from Winsted to Winchester, and I used to be familiar with the up-and-down road and heavy grades between this place and that village on the hills. By a wise system of grading, similar to that which Mr. Augur described, it is now a very fine and easy drive, and I understand that the road from here to Colebrook has been improved in the same manner. Those steep hills have been graded down or avoided. The people residing here have within their personal knowledge, good examples of just what we are trying to enforce upon the people of the State. I do not know any better example than what you have done right here in the neighborhood of this borough.

Mr. SEDGWICK. Probably one of the causes of the decrease in the population of our hill towns is to be found in the fact that they have such poor roads. The way the roads have been worked, under the contract system, and by taxes being worked out upon them, it has been impossible for a farmer to live in one of the hill towns and travel with any comfort over the roads to and from market. I am so situated that I am six miles from any center. I have to travel six miles in each direction to strike a railroad. It is a very important thing for me to have good roads, and not only that, but I am willing to pay for them, if I can have them. But I cannot have them, for two reasons that have just been stated. One is, the contract system, by which my neighbors in town can take contracts on the roads, and are determined to make money out of the town, and therefore will not lay out a dollar more than their contract calls for; and the other is, the system whereby we are working out our taxes on the roads, and when we are engaged in that work, we are apt to lean on our hoes pretty heavily. Mr. Avery has struck the key-note about our building roads. You are probably cognizant of the fact, that all along our Housatonic valley, we are trying to attract people to locate with us, and build summer residences; and as he says, the first question they ask is, "Have you good roads?" Now, in Stockbridge, Mass., they have probably as good roads as anywhere, and they have attracted as good a class of residents as is to be found in any town in the State. There is a gentleman in my vicinity who will be obliged to leave the place because he cannot have roads, good enough for him to drive on. Why can we not have good roads? In the town of Cornwall, we have 100 miles of road, and we have a tax of ten mills largely expended on roads and bridges. Every year, this work has to be done over.

We have, I am happy to say, undertaken some jobs which have been done in a permanent manner. If we could repair all our roads in that way, how many thousand dollars it would add to our taxable property! Every summer, we have some three hundred people who come from abroad to board with us, and if we can make the town attractive to this class of people, it is money in our pockets. I, for one, do not begrudge a dollar paid out for good roads.

Mr. PERKINS, of Winsted. The great difficulty is, that the expense of repairing roads and bridges is often as great in towns of low valuation, where the total grand list is from $400,000 to $800,000, as it is in towns where the valuation is from one to three millions. In these poor towns, if you allow them twenty dollars per mile annually for ordinary repairs of road, and ten dollars for repairs of bridges, you will find that you have a tax of from 4 or 5 mills to a cent on a dollar merely for those repairs. That is, the tax-payers must pay one dollar on the hundred in taxes to produce that little pittance of thirty dollars per mile, for ordinary repairs on the roads and bridges. Winchester has a valuation six times as large as Colebrook, where the roads cost just about as much as in Winchester. There is where the hardship comes in, and if you put these road taxes too high, you will drive every land-holder out of the town, and certainly one-half of the land-holders are ready enough to leave now, and the other half are anxious to follow the first. Some way must be contrived to have roads, and yet keep taxation within reasonable bounds. But to MacAdamize twenty or thirty miles of road is entirely out of the question. It would take the last dollar in a good many towns to pay the tax-collector, and I do not know who would be left to bid off the property. Therefore I should say, in brief, that it is very unfortunate to be extremely poor and yet have expensive roads and bridges to maintain. I am speaking on this subject from actual observation, having had a great deal to do with roads for some thirty-five years. A poverty town and poor roads in that town must to some extent accompany each other, until they stop the use of roads, and that time is not likely to come as long as these poor towns are inhabited.

Mr. Avery. I would make one suggestion in reply to the gentleman, and that is this: I have had some experience in making roads. I had a contract in our town for three years, and have acted as surveyor in the repair of roads considerably, and I am fully impressed with this idea, that country roads generally are made too narrow, and it costs more to keep them in repair for that reason. In my town, certainly, and it may be so in the town where the last speaker resides, the roads have sometimes been repaired by plowing up the sides and throwing the earth on to the middle, instead of widening the road. The wider a road is, the less the surface is gullied up. Now, if you can have your road wide enough, so that when a loaded team passes over it, it will not press out the edge of the road, there is a permanent improvement; but simply to plow up the edge of the road and round the middle does very little good. A few months' travel will wear deep ruts, and your road will be just as bad as it was before. That is the result of my observation and experience. My special aim, when I had charge of the repair of roads, was to widen them, so that there would be edge enough to hold the rut, and prevent the side of the road from being crowded out by the passage of heavy teams. Use your money in widening your road instead of rounding it up very narrow, and in that way, the same amount of money will go a great deal further.

Mr. ———. If you owned a five thousand dollar farm in the town of Voluntown or Sterling, would you vote in town meeting to widen the roads?

Mr. Avery. I have previously answered that question, but I will answer it again. I would lay out $500, $1,000, $2,500, or whatever it cost, to repair the roads in town, and unless there were ledges, or something of that kind in the way, my first object would be to widen those roads; plow the edge, and turn enough back to widen the road, and give more space for the travel. When your roads are repaired in that way, they will stand. I do not wish to boast,—I have nothing to boast of,—but I had a contract for some four miles of road for three years, and when I left that road, there was not one of those "thankeemarms" on it, there was not a place where the edge had been broken away, because I had widened it enough so that the edges would hold. I would widen a road the first thing I did, whether I had much money or little.

QUESTION. I would like to know what the standard width of a road should be?

Mr. AVERY. Well, I would certainly have a road not less than twenty feet wide.

QUESTION. You mean from outside ditch to outside?

Mr. AVERY. Well, if I was going to take a road to keep in repair for ten years, I would, unless it would cost a great deal for blasting ledges, or something of that kind, make the surface of that road twenty feet wide, at least; it would cost me less to keep it in repair during the ten years than if I narrowed it down to fifteen feet. I recollect meeting a man with a loaded team on a road at one time, the road was not as wide as it ought to have been, he was very accommodating in the matter, and turned out, and the consequence was, he came very near getting his team set. His wheel, as he turned towards the side of the road, came very near going over the edge. Here is a practical result of narrow roads; in the spring, your wheels will go half way to the hub, and perhaps, if it holds soft, they will go to the hub; whereas, if the road were wide enough, the edge would not be pressing out or the rut pressing down.

Mr. WADHAMS, of Goshen. I am in sympathy with all the gentlemen who have spoken, and peculiarly so with the gentleman who spoke before the last. I happen to be located in one of those hill towns, poor towns, with a hundred miles of road, and we have to lay out something like twenty dollars a mile annually upon our roads. We would like such roads as the gentleman who has given us the address this afternoon talks of, but can we make them? I suppose that if to-day our hundred miles of road had been so improved, the town would not be able to pay the expense of the roads; our whole property would not be sufficient to do it; and therefore we have to take the usual course, and get along more cheaply.

The gentleman has spoken of the contract system. In the region where I live, we have let the roads to the lowest bidder for periods of five years. We have been practising that system for the last forty-five years, and we are now about letting them for another five years, making half a century. It has been said here that the roads, under that system, would get so they would be impassable, that they would be narrowed up, and all that; but we have managed to live on them and ride over them. They are not as good as we desire perhaps, but as good as we can afford. The vote of the town is, that our roads shall be let by a committee of three, appointed for the purpose, to the lowest bidder, with discretionary power on the part of the committee to reject bids, so that they are not compelled to let every piece at public sale. The roads are to be repaired to the acceptance of a disinterested commission appointed by the Selectmen of the town, inspected in June and November, and if accepted by that commission, the contractor is to have two-thirds of his money in the spring, and the other third in the fall. Some of our roads cost five dollars per mile annual repairs; some fifty dollars. We have no manufactures; we have no wealth; we are farmers. We have had to learn to make roads ourselves, and travel on them. We have a grand list of eight or nine hundred thousand dollars. We have got along under this plan, and believe it as good a one as we can adopt, with our means. The roads are repaired by hauling the surface dirt on without any filling. As I say, we would like better roads, but I do not see how under heaven we are going to get them. I came here hoping that some plan would be suggested by which we could get them cheaply. One gentleman has said that when people come into town, the first inquiry is, "Are your roads good?" Our experience up in the hills is a little different. Oftener they inquire, "What are your taxes?"

Mr. N. HART, of W. Cornwall. That is the question I was just going to ask you: How many mills on the dollar is the tax in your town?

Mr. WADHAMS. Six mills. How many mills in your town?

Mr. HART. Eleven.

Mr. WADHAMS. Are your roads any better than ours?

Mr. HART. Not so good.

Mr. SEDGWICK. The roads in Goshen can be kept in repair cheaper than in any other town in Litchfield county. The principal roads are mainly level, and they have very few ledges, or anything of that kind, to go through.

In connection with this road business, I may state that I think a good many towns are working too many miles of road; they are working more roads than are necessary for the good of the town. By that I mean that in every town there are a few main roads, which ought to be kept in first-rate condition, and there are side roads, which do not need a large amount laid out on them to make them passable. But if a man is a little one side, as I am, he wants as good a road as his neighbors, who live on the main road, and he directs his efforts to that end. But I am satisfied in my own mind that that is not the thing. We want the principal part of the money raised for roads spent on those that are traveled the most, and then we shall have better roads.

Mr. WADHAMS. That is the plan adopted by the town of Goshen. The contractor makes up his mind what is required on a road, and makes his bid in accordance with it. As I said, we have some roads on which we lay out fifty dollars a mile, and some on which we lay out less than five. Mr. Sedgwick says, and I agree with him, that the important roads should be worked up to a point that other roads do not need; but when he says he thinks we have too many roads, I don't know about that. I think our town is discontinuing roads, is it not, to your knowledge?

Mr. SEDGWICK. Much to our sorrow.

Mr. WADHAMS. Well, I think they treat you meanly. The past year, our town, very unwisely, very unjustly, has discontinued roads that are not thoroughfares, but roads to farms, and appendages to farms, which have been bought with reference to the facility of getting to them by these public highways. Our town has, in three or four instances, thrown them out. I do not believe in it; I believe it is bad policy for the town; but still, these roads ought not to have the same amount expended on them which the main roads should have. But we believe our system is the correct one. We believe that if a man takes a piece of road under contract, it is for his individual interest to work that road economically. A man with a pair of oxen and a boy to drive, with a plow and scraper, will do as much, according to my experience, under the contract system, upon any piece of road, as four men will do in a day, upon an average, working by the day. It is his individual business. He is to accomplish a certain amount of work, and he does not want to spend a dollar beyond what is necessary. It is for his interest to work personally and honestly to get his work accepted. I would not ask him to do more than his contract calls for. If he can make money on it, very well. If he gets twenty-five dollars for a piece of road in my neighborhood that I can repair for twelve, all right. The next time I will bid on the road. I like the contract system. As I have said, we have followed it for forty-five years. Mr. Hart intimates that our roads are as good as those in his town, and the taxes are not very high. We should like better roads, but we do not know how to build them and pay for them.

Mr. Clark. The question of the construction of our public highways is one of great importance, and should be thoroughly considered. It is claimed, and I suppose rightly, that half the towns in this State are not able to adopt a better system of road-making; that they are too poor. And what is to be done? It seems to me that the proper thing to be done is for those towns to adopt a correct system, and carry it out as fast as they are able; not diffuse their tax over the whole roadway of the town, but concentrate it, and make one piece of road a model piece, such as will commend itself to the traveling public. If these poor towns cannot do much at first, they can do a few yards in one year; pass a vote to the effect that so much shall be done according to modern ideas on the subject of road-making. Let the experiment be tried, and continue it from year to year, until it shall commend itself to the public, and be thoroughly incorporated into the policy of the town. That is my idea. In the city of Hartford we are greatly in debt, like all other cities—four or five millions. It was proposed in town meeting, as we could not, of course, pay off this immense debt at once, that we should lay a tax of half a cent on a dollar, to form a sinking fund, which would gradually pay off that debt. This would be the same principle. Let the towns each take a piece of road and make it such as it should be, and go on with their old system elsewhere. I think much can be accomplished in this way. At all events, I throw out that suggestion for the consideration of gentlemen who may be interested in this subject.

Mr. **Hubbard**, of Middletown. The case of a small and poor town, with a large amount of roadway, requiring a heavy expenditure, is worthy of sympathy. The case of poverty anywhere is worthy of sympathy, and of every aid that anybody can suggest. It is embarrassing for a town to be poor, as it is for an individual; but I do not know that the principles of management are any different in the case of a town from what they would be in the case of an individual. Suppose a man owns a poor farm; he may own nothing else; he may be in debt for part of that; his farm needs improvement. What is he to do? Is he to sit down and say—"It is about all I can do to get a living off this farm, and as for improvement, it is no use; I will simply work along and get a living, and let it go just as it is." Is that the spirit in which any man must take hold of a work like that? Is that the spirit in which we must face any such difficulty as that? I think not. I think we should attempt improvements. Some towns, of course, must begin in a very small way; but this fact must be considered, that any farm that needs improvement, or any road that needs improvement, as long as the improvement is not made, much of the labor expended on the farm or the road is expended to poor advantage. Much of the labor that is spent in hauling loads over the roads in Goshen is wasted; and so it is in every town in the State. So on the farm, much of the labor that is expended in raising crops is wasted, because the necessary improvements are not made. I do not like to see the spirit that prompts a man to sit down before a difficulty with folded hands, and say, "I can do no better than before;

I can make no improvement. I must float with my head just out of water, and not attempt to get out on the solid land." I think the town of Goshen had better lay a tax of ten mills, as they do in Cornwall, and begin judiciously, on a system which will ensure good results in the future. Let them begin and put one piece of road in good condition; that will release them from the annual expense of keeping that piece of road in repair. It is a sinking fund, as the gentleman from Hartford has so pertinently said. Then they can go on and make an annual expenditure upon different pieces of road, and finally they will get all their roads in good condition.

Mr. WADHAMS. The intimation is that our roads are so miserable as to be impassable. We have the testimony of the gentleman from Cornwall that our roads are four times as good as theirs. I don't want the impression to go out that our roads are worse than others. I believe them to be better.

Mr. HUBBARD. I did not mean to convey the impression that the roads in Goshen were impassable or specially bad, but that all our roads were bad, especially where they have gone on, as I understand the gentleman to say has been the practice in his town, simply keeping the roads up. He gave me the impression, perhaps it is an erroneous one, that they did not attempt to make any improvement, but simply to keep the roads in passable repair.

Mr. WADHAMS. As a general thing we have occasionally expended a few hundred dollars for the purpose of grading. But, as I said, we calculate that from a little money, judiciously expended, we have got more worth than we should from a larger amount expended in some other way, because we have made it for the interest of the contractor to do his work well, in order to get the roads accepted.*

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* Mr. Hubbard is not acquainted with Goshen. One of the richest agricultural towns in the State, all public and private obligations are met with promptness. The farmers of Goshen never shrink from any duty. The roads are as good as they can well be made of the material used, (common earth,) and are not surpassed by those of any other town in the county. Many of the roads are level, and would be benefited by better drainage, and a coating of gravel. Adjoining towns look to Goshen to set an example in this direction. T. S. G.

Mr. **Hubbard.** In regard to that contract system, I think the town of Goshen has been extremely fortunate in its contractors. We have tried that system in Middletown, and somehow or other we fell into the hands of a very different class of people. It was not for their individual interest to put the roads in good condition, but to get their money and do just as little work as they possibly could.

Mr. **Wadhams.** That is generally the case with us. Not always; but generally the case.

Mr. **Hubbard.** That being the case, there is this other point to be considered. Any specification of a contract for the repair of a road, six, eight, or ten miles in length, for five years, must of necessity be vague. In our case, it is simply that the roads are to be kept in good repair, to the acceptance of a disinterested inspector. Well, that disinterested inspector was selected from another town, and the contractor took him over the road when there had not been any rain for some time, and asked him "if it was a reasonable road," and he said "it was a good road." I have known a road, for the repair of which the contractor received $130 a mile, where I honestly believe the amount expended did not equal $30. A hundred dollars a mile went into the pocket of the contractor, for which he gave no equivalent whatever.

Mr. **Wadhams.** Were your roads let out at public sale?

Mr. **Hubbard.** I think not. I do not know whether they were or not.

Mr. **Wadhams.** If they were, it was right that he should make all the money he could.

Mr. **Hubbard.** It may be all right that he should make all the money he could, but I do not want to pay taxes in that way. When I pay for working a road, I want the money expended on the road, and in that case it was not; it went into the contractor's pocket, and nothing was done on the road. That has been the way the contract system has worked. I think it is about the meanest way to work our roads that was ever invented. It is a system for getting the town's money into the pockets of the contractor, he rendering no equivalent therefor.

Mr. N. **Hart.** They have no "rings" in Goshen.

Mr. **Hubbard.** Then they are very fortunate indeed. I want simply to say, that where a town is poor, the same principles must apply as where an individual is poor. Where expenses are large, and income is small, the income must be spent with far more wisdom and economy than where it is ample. Certainly, if there is any system by which our roads can be permanently improved, and this constantly recurring annual expense reduced, those towns which are poor, and have large burdens in the way of road repairs, are the very places where the new system should be put in operation. But I protest against sitting down before a difficulty, and giving up any thoughts of improvement. We want better roads, not only in the small towns, but in the large ones, and we want to face the difficulties of the question fairly and squarely, with a determination to overcome them, whether our means be large or small.

Mr. **Rockwell**, of Winsted. A great deal of trouble and expense is often occasioned from the lack of a little money expended judiciously in turning water from our highways, both natural streams and surface water. I have no doubt that many gentlemen present, very likely all, have in their minds places where, during the time of freshets, the water overflows from the hill sides and washes away quite a length of road, causing considerable expense in repairing the damage. There are places that are almost as regularly washed as we have a freshet. I know such places, where a little money expended in enlarging sluices and bridges, in making break-waters, and in turning the water from the road, and passing it under and by, would save an annual expense of a considerable amount.

Another serious objection to the way of working our roads is the fact, that water is allowed to fill the ditches for long distances, and to accumulate in such a large volume that it washes away the shoulders of the road, causing considerable expense for repairing them again. My theory is, that the water should be turned from the road frequently, so as not to allow a volume to accumulate; and those places where the water comes from the hill side, in the time of great rains, should be protected by large bridges and sluices, or breakwaters. These are of the nature of permanent improvements. What I have said in regard to this want applies to all kinds of road, in our large, rich towns, as well as in our small and poor ones. It makes no difference whether a town is poor or rich as to the character of the repairs of roads; when once made, it should be permanent; and then we should have some degree of progress. It need not necessarily be costly.

Mr. WADHAMS. The difficulty the gentleman speaks of is guarded against by the contract system. I have a mile of road under contract, half a mile each side my house, and I take a little pride in keeping it passable. I want to do it as cheaply as possible, because I get but twenty dollars a mile. Proceeding in the fall to guard the road, I patch up the "Indian graves" a little, and after the turf gets rotted, I take out my hoe and turn off the water. An hour's work with a hoe will sometimes save a day's work of a man with a scraper. The contract system makes a man interested to guard the road as he would any other property.

Mr. GOLD. A question has been handed me that comes in well in connection with this subject: "Will the planting of trees by the highway pay the expense of planting, and of sufficient care to ensure their growth?" It is my opinion that it will, and I show my faith by my works, having planted the sides of most of my highways with trees.

Mr. STEWART. Fruit trees or shade trees?

Mr. GOLD. I have planted mostly with shade trees. I have in my mind a case where fruit trees have been planted very successfully; but more particularly I have in mind a road planted some fifty years ago, with shade trees. A gentleman who bought a farm in this county some fifty years ago, told me that the first day's work that he did on his farm, with his hired man, in the spring, was to plant maples in the street in front of his land. He sold that farm a few years ago to a man who had no particular eye for the beautiful, but the tree-planter told me that notwithstanding that, he believed he got five hundred dollars more for his farm because those trees stood there in the highway, than he would if they had not been there. So that he got rich returns for the day that he spent in planting those trees. The farm to which I refer is well known to many of you. It is in the edge of New Hartford, between there and Torringford. Deacon Watson was the gentleman who planted those trees, and I mention his name with honor, as having in those early days set us an example which we would do well to follow. The farm is known to every traveler through that part of the State for the beauty of the avenue, lined with the maples.

Mr. Hoyt. Our people have come to the conclusion that it is absolutely necessary to make permanent improvements on our roads every year. From our nearness to and ease of access from New York, we have a great many people residing with us in the summer. We have a great many high hills. We have already graded down one hill this season, and we have another one under contract. Our deepest fill is eight feet. We have cut five feet off of the top. It was formerly hard work for a team to draw 1500 pounds up that hill. The same team could probably now take a load of from a ton and a half to two tons up the hill easier than it could take 1500 pounds before. Our people calculate to do some such job every year.

Mr. T. L. Hart. I agree with the gentleman last up, and I believe one way to improve our roads, is by setting out trees, as Mr. Gold has mentioned, and we can improve them in that way at less expense than in any other. It costs but very little to take up a few trees every spring, five, ten, or fifteen, and set them out by the wayside; it costs but very little to take care of them from year to year, and the growth will be sufficient in a very few years to pay the whole expense of improving the road, and the cost of the transplanting in addition. Some few years ago, our farmer's club in Cornwall passed a vote recommending or advising each member to set out at least five trees each year on the highway. Some of them did it, and the consequence is, we have now a large number of trees, some of which are eight, ten, and twelve inches through, and serve greatly to beautify the road. In one case, about one hundred cherry trees were set out, and last summer I have no doubt that there were at least a hundred bushels of cherries growing on the highway. Certainly, I went upon two of the trees and picked a bushel off of each, and they were nothing like gone then. At the price which such fruit brings in the market, which is about a York shilling a quart, the last crop would have paid the whole expense of setting out those trees. To say nothing of beautifying the highway, to say nothing of the pleasure of riding beneath their shade, when the sun is hot on a summer day, the crop itself would certainly have paid vastly more than the whole expense of setting out and taking care of those trees. And then again, the amount of wood that would grow in twenty or twenty-five years would pay the expense twice over, I might say ten times over, of setting out the trees.

One word in reference to how they should be set out. I notice that considerable has been done in this direction in Litchfield county. Some have set their trees next to the line of the fence, whereas, if they had set them as near the road as they could be without interfering with travel and repairs, they would have furnished a shade which would have been valuable to the traveling community, and the owner's lot would not have been shaded and injured as it has been by setting them out so near.

How should they be set out? I would recommend that a deep, broad hole be dug, sufficient to take in all the roots, without bending them. The maple may be very easily taken up; the roots run on the surface, most of them. Then cut off all the top, six or eight feet, may be, and set them out, throwing in a pail of water, and throwing on the dirt. Then, with a little care in August, if there comes a dry time, they will get a foothold, so that they will need but little care to make them grow. The great difficulty arises from leaving on the whole top. A farmer who sets out trees wants to have them grow at once, so he leaves the tops on. He does not seem to understand that if he cuts off the entire top, the tree will be a great deal more likely to live, and in five years will have more top than if he left it all on. Besides, if the top is left on, before the roots get hold, the tree will be swayed by the wind, and perhaps turned over; whereas, if the top is removed, there will be nothing for the wind to lay hold of, and the tree will be more sure to stand well and get a fair growth.

I think there is nothing to which farmers can turn their attention with greater profit than the setting of trees by the wayside. I would recommend the maple and elm, although it is a great deal of trouble to take up an elm, because the roots go right down into the ground, unless it is in a swamp. A maple can be taken up with a crowbar, shovel and hoe, and it will cost but very little to remove it. The farm to which I have referred, would sell for two or three thousand dollars more from the fact that the highway is shaded by trees. It is a luxury to go through that grove on a warm day.

Mr. PERKINS. Ten years ago last spring, I moved from Massachusetts to this State. The last of October, 1865, I set out twenty or twenty-two maple trees, a mile from the village where I now stand. I did not cut off the top of any one of them, and every one of them lived. I should not want any one to cut off the top of a maple, or any forest tree that I wanted to set in front of my house, if I wanted to see a stately tree. If you want a low, bushy tree, of course you would cut off the top.

Mr. T. L. HART. The experience of the last speaker does not correspond with mine. I have scarcely lost a tree when the head was cut off. A tree will throw out three times as many thrifty shoots when headed in, as it will if the top is allowed to remain.

Adjourned to evening.

EVENING SESSION.

HINTS ON RURAL ARCHITECTURE.

By Hon. Francis Gillette, of Hartford.

A home in the country! A country home! How the very mention of it thrills the soul, like sweetest music! A rural home, with all that it implies in its beautiful and grand possibilities; its free, salubrious air; its green grass and waving grain; its trees and shrubs; its singing birds, grazing cattle, and sportive flocks; its garden, flowers and fruits; its well of crystal water, drawn, perhaps, in "the old oaken bucket;" the charming splendors of its mornings, and its gorgeous sunsets, just over the hills; its boundless and magnificent prospects,—what other place in the wide world lies so near the boundaries of "the better country!" How must the cribbed and cramped denizen of a city house, crowded between two other houses, which obstruct heaven's sweet light and healthful air, as he looks out of his darkened home upon the opposite brick walls, and hears the din of the noisy streets, sigh for the quiet, freedom, and pleasures of a country home! If born and reared in the country, he can feel the full pathos of Wordworth's exquisite stanza:

> "How dear to my heart are the scenes of my childhood,
> When fond recollection presents them to view!
> The orchard, the meadow, the deep-tangled wildwood,
> And every loved spot that my infancy knew."

Most of the business men of our cities are fondly picturing, for future enjoyment, the pleasures of a rural home, to which they hope to retire, should fortune smile. But in most cases the pity is, fortune frowns, or comes attended by her intrusive little *mis*, as her precursor and herald, making *mis*fortune for the poor fellows. But it is no romantic or visionary picture which looms up before them, when they dream of a country home, with its green fields, beautiful hills, picturesque landscapes, musical brooks, wild woods, shady groves, broad plains, limpid springs, cool glens, grand mountains, and blue heavens bending in glory over all. This, this is the acme of their earthly aspirations; this is Paradise regained; but Paradise, alas! not without its thistles and thorns.

Society rests upon rural homes especially, for support. The Church, the State, the School, all humane and Christian institutions are built upon them. There are unfolded, nourished and strengthened the sterling virtues and hallowed affections which adorn our civilization. To their moral influences and sweet charities we look for the dwarfing and final extirpation of the thistles and the thorns. To the noble men and gentle women born and reared in such homes we look, to counteract the alarming demoralization and decay incident to city life, and to infuse a fresh salubrity and healthful vitality into the social atmosphere.

Inferior creatures seek their highest good in the home, as seen in dark cave or on mountain-aerie; in burrow or nest; in waxen cell or soft cocoon: man turns to it for refuge and tranquillity from the storms of life; and one of the most pathetic outcries of the Man of sorrows on his earthly pilgrimage, was his touching lament: "The foxes have holes, and the birds of the air have nests, but the Son of man hath not where to lay his head."

We are to inquire into the condition or architecture of a rural home as it should be; or otherwise, into the proper location, structure and arrangement of farm-houses and other farm buildings. In so doing it is presumed that no detail of plans —such as are found in various architectural works—is expected, but rather a few fundamental principles or suggestions, which it is hoped will commend themselves to the favor of this society, and all others concerned. While it is admitted that cheering progress has been made in rural architecture, as in many things else, during the last half century, it is apparent that the goal of perfection has not yet been reached, and ample room remains for further improvement. Onward, right onward, is still our watchword! Progress, development, improvement, upward, sunward,—these words waken echoes in our souls, and fill us with hopes and aspirations.

The chief ends to be aimed at in the location and construction of farm-houses, and other farm buildings, are healthfulness, convenience, economy, and tastefulness; or, to embrace them all in one comprehensive term, fitness,—the exact adaptation of the means used to the end sought. "Houses," says Lord Bacon, "are built to live in, not to look at." By this he is understood to mean that the great object is utility, and not ostentation, or a foolish attempt to please the eye at the sacrifice of the practical requisites. This is often done, however, by ambitious novices in house-building, who are heedless of Dr. Franklin's warning against paying too dear for the whistle.

The location of a house to live in is of primary importance. The site chosen should be slightly elevated ground, sloping every way sufficiently to carry off all superfluous water; far away from malarious marshes; convenient of access from every part of the farm, and commanding pleasant prospects in all directions. Or, if it be found impracticable to choose such a site, and the proprietor is necessitated to build upon low, moist ground, where his cellar will be liable to frequent floodings, his first endeavor should be to effect a thorough drainage of the premises. The beaver and the muskrat instinctively seek watery homes, but man is so differently constituted that he can not thrive under such conditions. Dryness is as essential to the preservation of the timbers of a house as to the health of its occupants. To the want of it are ascribed many of the malignant types of disease which scourge society.

Another important element in location is defence from the rigors of our harsh climate. In our childhood we were taught that there are four seasons in the year—spring, summer, autumn, and winter. This may have been a natural division of the year in some remote age of the world, and the tradition has come down to us with the sanctions of ancient authority. Thomson accepted the common division, and memelodiously poetized of four seasons. Had he lived in New England he could not have written so enchantingly of the spring without drawing largely upon the poet's license. The truth is, spring seems to have nearly dropped out of the calendar, and migrated to milder climes, leaving winter, with his icy scepter, to rule well-nigh half the year. Hence, we should be careful so to locate our houses as to shield their inmates as much as possible from his furious winds and pelting storms. Give the cold tyrant the cold shoulder, by selecting a leeward, sheltered, sunny site, and so arranging the house and out-buildings as to baffle his rage, and send him roaring through the forests. The high, rounded hill-top is beautiful for situation in summer, but in our frigid climate, all things considered, the side-hill or lowly vale has superior advantages, not only as affording a partial covert from the winter winds and storms, but also facilities for the introduction to the premises of running spring-water, an invaluable acquisition to any home. And, moreover, the produce of the outlying farm, instead of having to be drawn uphill, will easily find its way into the garner by the law of gravitation, as the water runs into its reservoirs.

I recall an instance in which the father of a family located upon the top of a beautiful hill, with fine prospects to be sure, but with many attendant disadvantages, all his life long. His son, when he succeeded to the possession of the farm, located in the valley, lying at the foot of the hill on which his father had lived, carted his crops down the hill up which his father had drawn his; turned a limpid brook to his house and barns; found mitigation of the winds and storms of winter; and he concluded, as he told me, that however beautiful and enchanting the views upon the hills may be, they are no compensation for foregoing the many substantial advantages of a valley or hill-side home.

Another consideration of great importance in the location of farming establishments is to suit them to the farm, rather than to the highway. So plan them as to accommodate the farm first, and the public afterward. The passion of the New England farmer is to nestle down by the roadside as closely as possible. With hundreds of acres stretching away in his rear, he can hardly afford himself a door-yard even for a lilac bush and a few roses. To gratify this strange propensity he often foregoes the most inviting sites upon his grounds—daily convenience, beauty of prospect, music of brook, mirror of lake, shade of grove, and shelter of forest—all are sacrificed to the overmastering passion for nearness to the highway. Business men generally build to accommodate their business; our farmers build to accommodate others more than themselves. The Southern planter builds to accommodate his plantation, choosing the most eligible site, irrespective of the highway. So is it with some Western farmers of foreign descent. And the universal rule should be, other things being favorable, to build upon that one site of the farm that will afford the easiest access to the fields, facilitate their cultivation, and diminish travel for men and teams. Proximity to the roadside may be very convenient for burglars and tramps, but very inconvenient for farmers, whose business is on their farms, and not upon the highway. Good taste has a word to say in favor of this improvement, and urges the disappearance from our rural streets of the twin blemishes, so often seen there, a farm-house crowded close to the street on one side, and a farm-barn to match it equally close on the other,—an offensive reminder again of Scylla and Charybdis.

Another very important item in the construction of a rural home relates to its material. In almost every locality within our Commonwealth the builder can choose between an abundant variety of materials—wood, stone, brick, or concrete. Of these wood is the most common, and stone the best. The objection to wood is, that it is combustible, light, and perishable; brick are durable and solid enough, but unsightly and inharmonious with rural surroundings; stone is too expensive; and concrete, though cheap and lasting, lacks the public confidence. Of all these different materials which shall be chosen? I do not hesitate to answer—concrete. The following are some of the advantages which recommend it to popular favor:

It is cheap, costing very much less, where filling-stone, gravel, or very coarse sand are plenteous, than any other building material,—not more generally than half the expense of brick. The rough surface of the walls holds the finishing coat of stucco tenaciously, which makes a permanent and handsome exterior, impervious to rain or wind, and, moreover, affords a secure fastening for the tendrils of climbing vines, like the woodbine, over which they eagerly run and luxuriate, making the country house a green and vine-clad home.

The concrete house wall is warm in winter and cool in summer, and, properly built, is not liable to dampness. It is dry, and in plastering requires no furring out, as do brick and stone walls, the wall being porous and containing the air diffused through its cells, which in the other cases is confined between the furring and the wall. By not requiring furring the concrete wall affords no lodgment for colonies of vermin, to serenade the helpless inmates of the house at unseasonable hours; and, in case of fire below, there is no direct communication of the flames to the stories above, as in the other cases, in which the furred-out spaces serve as so many drafty chimneys to draw the flames up quickly into the attic, and wrap the whole house in swift destruction.

Disastrous failures have been reported in concrete walls; but, as in the more common materials of house-building, they have occurred from insufficient strength of material, or inexperienced and unskilful workmanship. There are many details in the construction which must receive attention to make it successful. With strength of material and skill in construction the concrete wall is as sure to stand as any other, and harden as the circling years revolve, until it will rival some natural stone formations in solidity and strength.

I may be excused for speaking on this matter somewhat from personal experience. Having built several houses of this material, and occupied one of them for the last twenty years, I am confident of not being too sanguine of its superiority. As I have passed through many sections of our State and country abounding with most of the materials for concrete structures, and noticed the clapboard houses in which the people dwell—light, shaky, and perishable—I have marveled at their unwisdom in housing themselves in such frail air-castles, when nature has lavished upon them superabundant materials for the construction of houses, comfortable, cheap, healthful, and lasting from generation to generation. And the great economy of such habitations—the immense saving of labor and expense—what domestic or political economist can estimate it! Compared with wood, as a building material, the cost to a family through successive generations would be many fold less, not having to be preserved by paint, or rebuilt every half century, or a little more.

The first object to be aimed at in building a farm-house, or any other in fact, is a dry, light, and well-ventilated cellar. While it is indispensable to the convenience and comfort of the family, it has much to do with its sanitary condition. If damp, dark and unventilated, and filthy with decaying vegetables or other putrescence, it exhales through every department of the house disease and death. There are born pains, rheumatisms and fevers. Hence, let the cellar receive special attention and unstinted liberality in building. Spare no pains or expense to make it a source of health and life, instead of a cavern of disease and death. Extend it under the whole house; let it be eight and a half or nine feet high, with three feet of the outside wall above the external surface, thus giving room for the entrance of light through ample windows.

The cellar drain should be extended around just outside of the wall and a few inches below the grade of the cellar, so as to prevent any inflow of water. Let this slightly slope from the center to the circumference, that it may carry off any water that may ooze through the bottom; cover the bottom with small stones, and these with cement mortar an inch or more in thickness.

For ventilation, when too cold to open the basement windows, provide large apertures in the chimneys resting on the cellar bottom, and see to it that no waste matter or filth be allowed to accumulate anywhere in the whole cellar. And to perfect the work, whitewash the walls and plaster the ceiling.

Such a cellar will be waterproof, vermin-proof, frost-proof, light, airy, convenient, pleasant, healthful—a perpetual comfort and joy to the household. In the olden time and under a different civilization, we are informed that the wise man built his house upon a rock. This might have done well enough, and passed for wisdom in an age and country not blessed with "the modern improvements." But the man in this age and country who should copy his example, and set his house upon a rock, instead of founding it on such a basement as has been described, might pass for a very devout worshiper of Judea, but a very poor house-builder of Connecticut.

Let us now pass up from the cellar to the kitchen of our ideal farm-house. This is the chief apartment—the heart of the domestic establishment; the nucleus around which all other apartments should crystalize. A sensible rule for the internal division of the house would be—first, build the kitchen with its appurtenances, and then, if the purse will warrant, build the other rooms around it. Appropriate room sufficient for a spacious, convenient and pleasant kitchen, though little or none should be left for the parlor. Nothing in rural architecture could be more unwise than to cramp the kitchen for the amplification of the other apartments. Comparatively the kitchen is every thing, the parlor nothing. It is the great workshop and vitalizer of the whole habitation. When the light fades from its windows darkness reigns in the household. Washing, ironing, butter and cheese-making, boiling, baking, and brewing—if still foolishly persisted in—are carried on there. Huskings and apple-parings, and some other frolicsome pastimes—as some of us may vividly remember—were formerly held in this apartment. In those frugal old days when industry and economy were thought to rank among the virtues, spacious parlors, with their Brussels' carpets, lace curtains, and upholstered chairs, did not crowd the kitchen into a closet, and usurp supremacy over the whole house. Then too, every body was not in debt, nor were many farmers put to the inconvenience of having another man's farm lying upon the top of theirs by mortgage. Such infelicities were not frequent in the olden days.

Next in importance to the kitchen is the family sitting or living room. This should be convenient to the kitchen, ample in size, sunny, cheerful, pleasant, and so furnished and decorated as to be thoroughly attractive. It combines drawing-room, dining-room, sewing-room, guest-room. It contains the sewing-machine, the bird-cage, the piano, the flower-stand, and the pictures. This is the dear resort of the family—parents and children meet and mingle here in sweet accord and pleasant pastime. It should be perfectly enjoyable, and consecrated especially to the domestic virtues. Let it be a genial nestling-place for the dear children to grow and develop in.

I would not be understood to object to a simple and modest parlor in the farm-house, provided it is wanted for use rather than show, and the proprietor can afford the luxury. But a parlor to be shut up and kept as a superfluity, into which the children hardly dare peep, or adults step, lest they should violate its sanctity, is not to be recommended. It is a vain show and a sickly ostentation, discountenanced alike by good taste and household economy.

In this connection I would say a word in favor of a basement kitchen and dining-room, at the risk, perhaps, of incurring feminine displeasure. While the laborious stairway is objected to by some experienced house-keepers, it cannot be denied that this arrangement has many advantages in point of economy, convenience, neatness, and comfort. And, moreover, it can not be shown to be any greater hardship, to descend a stairway into the basement than to ascend another to the chambers; and they who disapprove the former seldom take exception to the latter.

The one great, vital, indispensable requisite of the whole house in all its main apartments, is ventilation, thorough, perfect ventilation. It is truly lamentable that with an atmosphere forty or fifty miles high, and pressing upon us every way, as the water presses upon the fish in the ocean, men should stint themselves of the lavish luxury, and seek out many inventions to exclude it from their dwellings. Close doors, tight windows, and air-tight stoves are considered among the modern improvements in household life. Any contrivance that will prevent the ingress of the air in its fresh purity, wins the popular favor, and discredits the old comparison—" free as air."

A recent writer in the Edinburgh Review, in discussing this subject, sensibly remarks: " The true object of house-building is yet to be learned. Pure air is as absolute a necessity to human beings, as good food and untainted water; but bad air kills only by inches, while unwholesome food and foul water often do their work quickly."

Dr. Franklin, in one of his letters, says that some of his contemporaries were as much afraid of fresh air as hydrophobists are of fresh water. " I myself," he admits, " formerly had this prejudice, this airphobia, as I now account it. I considered it an enemy, and closed with great care every crevice in the rooms which I inhabited. Experience has convinced me of my error. I now look upon fresh air as a friend. I even sleep with an open window." And he goes on dilating upon the great benefits he had experienced from breathing fresh air, night and day.

The best ventilator that science has yet discovered is the open fire-place with its ample chimney. This was the primitive method from time immemorial. Our fathers were herein more practical philosophers than many later ones, who have been studying the problem of ventilating an air-tight room. They will all come around, at last, from their scientific vagaries to the old-time fire-place, with its mammoth mouth and huge chimney, to conduct off the smoke and foul air, both of which are foes to comfort and life, it being not easy to decide which is greater. Every dwelling-house should be abundantly supplied with such ventilators. They are cheaper than medication, forestall neuralgic twinges, and impart a genial warmth much more agreeable than that produced by St. Anthony's fire.

It is doubtful whether our civilization can make further progress without an improved ventilation in our homes, our schools, our churches, our court-rooms, our legislative and public halls. Poisonous air is no less a foe to righteousness and peace than to health and life. Men, women, and children, living on the unventilated, air-tight plan, live at what Dr. Watts would call "a poor dying rate." They are unfitted for the stern duties of life, and can not be expected to exemplify in their full-blown beauty and fragrance the virtues of the fireside, the citizen, or the Christian.

We smile with wonder and incredulity at the way our fathers lived in their wind-castles, before stoves and furnaces were invented, with loose doors, rattling windows, and huge fire-places. The secret of their robust health and manly virtues was very much in the pure and vitalizing air which they breathed. To their souls there was music in the winds which whistled without, and the roar of the hearth-fire which blazed up the chimney within. They needed not to trouble their minds with the perplexing problem of ventilation. They had it spontaneous, at no other cost than immense wood-piles. The forests fell before them, and not many modern farmers can afford the fire-side luxury which they enjoyed. But the same end can be reached by more economical methods—by the contraction of the fire-place and chimney, adopting improved modes of warming, and maintaining only sufficient fire upon the hearth to produce perfect ventilation, diffuse a cheery glow through the room, and please the household divinities. A furnace register, supplied with moderately heated air directly from without, for warming, supplemented by a little fire upon the hearth for ventilation and cheerfulness, is the highest attainment yet made toward perfect domestic comfort and healthfulness.

Before leaving the farm-house something must be said in relation to its style. Were I to recommend any one of the different orders of architecture, as on the whole best suited to the purpose, it would be the modern rural Gothic. This harmonizes with country surroundings—its forests, trees, green fields, hills and mountains. At the same time it admits of a convenient and economical division of the area within, and obviates the accumulation of ice and snow upon the roof. A roof so pitched as to prevent any such lodgment upon it, and covered with slate, or the first quality of shingles, is, for this climate, the perfection of roofing. It is durable, economical, and every way satisfactory.

You are familiar with the answer of the ancient rhetorician to the question, what is the first, the second, and the third requisite in oratory? Action, action, action, was his reply. So were I asked what is the first, the second, and the third essential in rural architecture, my answer would be simplicity, simplicity, simplicity. This rule would exclude every thing for mere show or effect, such as useless gables, meaningless pinnacles, acute angles, fantastic devices, and tawdry embellishments. All genuine ornamentation is born of utility; springing from any other source it is deformity. The plain and honest countryman should leave all gewgaws and impostures to be indulged in and enjoyed by the city parvenu and his admirers.

The author of the book entitled "The Stones of Venice," says, "I never met with an architect who did not think that ornament is something bought and stuck on, thinking but little more than some women do of the other and only kind—St. Peter's kind—not that outward adorning, but the inner of the heart. This better ornament is the *only* ornament. A noble building never has any extraneous ornament. We do not build a temple and then dress it. We create it in its loveliness, and leave it as her Maker left Eve—not unadorned, as I believe, but so adorned as to need no feather-crown."

This last compound word reminds me of recently sitting in a church behind a bonnet trimmed with dead birds, or the plumage of such in its natural position. Subsequently I was informed that this barbarity sprang, not from an Indian fondness for feathers, but from the latest bulletin of Parisian fashion. And one lady of Paris is reported to have birded her ball-dress with a thousand humming-birds. This is the ornamentation stuck on for display, and is as distasteful as it is barbarous. What is really ornamental to woman is the beauty of the birds shining out sweetly from her face, and the music of the birds making melody in her heart, and the graceful loveliness of the birds reflected in all her life. Thomson expresses the true idea in saying,

"Loveliness
Needs not the foreign aid of ornament,
But is when unadorned, adorned the most."

And Milton utters the same sentiment concerning the great mother of us all:

"In naked beauty more adorned,
More lovely than Pandora."

In all this you will please to understand that I do not take exception to the portico, the veranda, the bay-window, the balcony, blind, dormer-window, or anything else that springs naturally and gracefully from utility; that crops out from the main design, as an intrinsic and subjective part thereof.

But we pass from the farm-house to its out-buildings, of which the barn is the most important. The *barn*, you will please to observe, and not barns. On some extensive farms are seen several small, cheap barns, promiscuously dotting the landscape, without any obvious plan, instead of one large, commodious and costly barn, capacious enough to shelter all the farm-stock, and store the farm-crops. In point of convenience, economy, and good husbandry, this is an unwise policy for general farming, and has nothing to recommend it but a diminished risk from fire. The farmer having two isolated barns, in case one is fired, has one left; whereas, if but one, and that is burned, he is utterly barnless.

In relation to location, the one large, complete barn should be set far enough away from the dwelling-house to prevent any annoyance to the inmates from offensive odors, and guard against intercommunication by fire. If practicable it should be located where it will serve as a barrier against the cold winds of winter, and be easily accessible, not only from the back door of the house, but also from every field of the homestead farm. It should have a light, dry and airy basement, which is an absolutely indispensable requisite. I would almost as soon advise leaving off the roof as leaving out the basement.

But, exclaims many an inquiring farmer, "I have no side-hill or slope conveniently near, and what shall I do?" Make one. This can be done without any great expense. A slight reconstruction of the site by a transposition of the earth from the south or open side to the north and west sides, together with the earth excavated for the basement, will be sufficient to accomplish the object, and secure an artificial site, equal in most respects to a natural one, and possibly more convenient and suitable.

How many utilities a good basement subserves! Warm and comfortable stabling for the domestic animals in our harsh climate, is not the least. Both economy and humanity are agreed in this. Warmth is the inseparable condition of all life, animal and vegetable. If not fostered without, it must be secured by additional food within. The combustion of life must be fed, and vitality maintained. Haystack-feeding farmers need large and fertile meadows, which their wasteful practice is poorly suited to produce.

Here too is room for a perfect cellar for the storage of esculent roots, some of which are not particularly savory as household perfumers. A tool-apartment for all farm-implements, and vehicles, finds an appropriate place in the basement. If the proprietor is favored with water running to his premises, he can conduct it to a sheltered spot in the basement, not very much exposed to frost, where his stock will always find it open to quench their thirst. Or should he be necessitated to resort to the next best watering convenience, namely, capacious cement cisterns, taking the roof-water, he can so locate them as to secure the same advantage.

Another end gained by this semi-subterranean apartment is one which must be highly appreciated by every intelligent farmer, which is the facility it affords for increasing the fertility of his farm, and yielding him prosperity and wealth. A sheltered stercorary is a rich mine of affluence to the New England farmer, more valuable to himself and the world than the golden deposits of other lands.

Most wide-awake and enterprising farmers are incommoded for the want of more barn-room. By this arrangement below, the space above can be used for storing the hay and grain of the farm, and other purposes. And besides, since the introduction of the horse-pitchfork, it has been found practicable to build barns much higher than before, with posts twenty or twenty-four feet long, instead of twelve or fourteen, thus doubling the capacity of the barn without greatly enhancing its cost.

Under the roof of this ample barn I would centralize most of the purposes of the small out-buildings, which are so often blemishes to the premises. The horse-stalls, carriage-room, piggery, poultry-house, workshop, granary, every thing except the wood-house, which can be dispensed with entirely by using some part of the house-cellar instead, the vacancy made in most cellars, I am happy to say, by the disappearance of the old-time occupants too fondly tolerated under the delusion that evil spirits did not enter into cider-casks, as they once appropriately entered into the herd of swine, at the bidding of the Master.

The same mode of drainage recommended for the house-cellar, should be adopted in draining the basement of the barn; its walls be made of stone, brick, or concrete, and the superstructure of the common frame-timbers, covered with good pine boards, put on vertically, and the seams neatly battened. Economy would leave the siding unplaned and rough, that it might firmly hold a cheap paint, of which the basis is lime, and thus save the much greater cost of frequent coats of oil and lead.

I must suggest in this connection a general rule of great importance, to be observed in rural architecture, and in the ordering of rural affairs: So build and so order as to make the homestead pleasant and delightsome to the younger members of the household, especially to the boys. Let every thing contribute to make them happy in the home of their childhood, and imbue them with the sentiment:

> "Be it ever so humble there's no place like home."

Give them pleasant rooms neatly furnished, graced with a few choice books and adorned with pictures, not omitting some of Rosa Bonheur's admirable pictures of animals.

For their out-door pleasure and amusement, along on their way up to maturity, give them the dovecote, the garden-patch, the duck-pond, the chickens, the rabbits; and later, the calf, the lamb, the steers, the colt, and whatever other reasonable gratification shall tend to sweeten country-life to their taste, and hallow it to their hearts by pleasant associations.

Meanwhile, have a care, fathers, not to discourage and alienate your sons from home and country-life, by treating them, not so much as sons, as hired servants, and laying upon their young shoulders burdens too heavy for their immature years, and tasks grievous to be borne. How many farmers' sons have thus been made to hate and abandon the homestead and country-life, by early associating therewith all unpleasantnesses—hard paternal treatment, wearisome labors, uncheered toil, plodding drudgery, intolerable dullness, utter distastefulness, and thorough disgust!

If farmers would retain their boys at home they must make home attractive to them, by having some reference to their wishes and wants in building, and in conducting agricultural affairs. Let all cold-hearted, harsh, and exacting fathers remember that their sons have rights and feelings which they must respect and indulge if they would make them contented and happy at home, and save them from becoming city holocausts.

One of the most deplorable evils which mar our agricultural prosperity is the desertion of our fields. The city is drawing the young men away and centralizing population, enterprise, and wealth. The city is absorbing the country. The city is becoming everything; the country nothing. Thither are rushing thousands of young farmers by birth and education to find their fortunes, at the fearful hazard of losing themselves. Not one in twenty succeeds to realize his golden hopes, while many, many, alas! disappointed and discouraged, fall victims to vice, and, as they sink, look back with vain regrets upon the virtuous and happy country life they might have led. Parents, be warned and entreated to build, plan, and strive to keep your sons out of the city, that ingulfing whirlpool in which so many are wrecked and go down. Make the country home so attractive and captivating to their fresh hopes that the city's glitter and fascinations shall have no charms for them. Inspire them with the sentiment of Washington in all its truth and beauty: "Agriculture is the most useful, the most healthful, and the most honorable occupation of mankind."

In preparing this paper, and submitting the foregoing suggestions upon rural architecture to the attention of this society, I have been animated by the pleasing hope of contributing somewhat to the domestic comfort of the people, and the moral advancement and elevation of society. If, as Swift says, he who makes two blades of grass or two ears of corn to grow where but one grew before, is a benefactor of mankind, how much greater service does that man render to society who makes the homes of the people convenient, comfortable, healthful, pleasant, tasteful, beautiful, and conducive alike to their happiness and an advanced civilization! Splendid palaces, magnificent temples, noble monuments, and lofty cathedrals we gaze upon with glowing admiration, as notable specimens of artistic beauty and grandeur. But how immeasureably inferior in importance to human welfare are all these architectural wonders to the humble homes of the people, as affecting their habits, morals, and happiness! We do not look for neatness, order, or refinement in a shanty or hovel, but are disappointed at not finding them in the farm-house or mansion. Says Dr. Timothy Dwight on this point: "Uncouth, mean, ragged, and dirty houses will regularly be accompanied by coarse and groveling manners. The dress, the furniture, the equipage, the mode of living, and the manners will all correspond with the appearance of the dwellings, and universally be vulgar and debased. On the inhabitants of such houses it will be difficult, if not impossible, to work a conviction that intelligence is either necessary or useful. Generally they will regard learning and science only with contempt. Of morals, except in the coarsest form, and that which has the least influence on the heart, they will scarcely have any apprehension.

"The very fact that men see good houses around them, more than almost anything else, will awaken in them a sense of the superiority of their occupants. The sense of beauty is necessarily accompanied by a perception of its superiority over deformity, and is instinctively felt to confer this superiority on those who can call it their own. This, I apprehend, is the manner in which coarse society is started toward improvement; for no objects but those that are sensible can make any considerable impression on coarse minds."

It would seem, then, that this society has done well in turning its attention to rural architecture, not in an economic sense only, but also in a moral and esthetic view. The theme is worthy of its best minds and most cultured pens. The social problem has been demonstrated by science and history, that the character of a people is organically affected and molded by their dwellings. The most improving and civilizing element in social life is an improved and civilizing home. It is the index on the social scale; the meter of human advancement; the key-note to the music of social progress; the keystone to the arch of modern society and civilization.

I must be permitted to congratulate this society upon the final success of its persistent and laudable efforts, from year to year, to obtain from the Legislature an Agricultural Experiment Station. It marks a new era in Connecticut agriculture, somewhat as did the discovery of the magnetic needle in that of navigation. Truly, the world does move, and faster, too, than when the old philosopher persistently flung this truth into the blind face of the bigoted age in which he lived. During the last half century it has moved with accelerated motion, as if hastening to the close of its awful drama. Never during any other period of fifty years since the world began have science and invention won over nature so many and so signal victories. Many gentlemen now before me can remember the time when there was no mower, no reaper, no spreader, no sower, no horse-rake, no cast-iron plow, no thresher, no cook-stove, no furnace, no sewing or knitting machine, no railway, no steamship (river or ocean), no magnetic telegraph (ærial or submarine), no steam fire-engine, no photograph, no spectroscope, no thousand discoveries, improvements, and inventions which distinguish this epoch as the most progressive and the grandest in human history. What wonders, surpassing the dreams of romance and the fables of fiction, hath genius wrought! Had there been as great progress, meanwhile, in the moral as in the material world, the glad time foretold by prophecy would have been near when swords shall be beaten into plowshares and spears into pruning-hooks. But, alas! a corresponding intellectual activity has produced and perfected the implements of human slaughter. The Gatling guns, the columbiads, and the ironclad monitors do not herald the millennium, or foretell peace on earth and good-will to men. God pity and help us in our orphanage!*

But let us gird up our loins and push on in the career of improvement. Much has been accomplished in the past, and much more remains to be done in the future. Especially let us do our utmost to refine and elevate the multitude by improving and beautifying their homes. The good work has been already well begun. Forty years ago the farm-houses throughout the State, with rare exceptions, were dilapidated, shabby, weather-beaten, and dismal, with not much else to recommend them but free ventilation; and a model barn was still more seldom seen. Now there are thousands of each. The old, brown, decayed houses, with loose and rattling clapboards, have been renovated; others of improved fashion have been built; the barn and other out-buildings have shared in the general amelioration, and the country now smiles with many elegant and inviting rural homes, where are enjoyed—

> "An elegant sufficiency, content,
> Retirement, rural quiet, friendship, books,
> Ease and alternate labor, useful life,
> Progressive virtue, and approving heaven."

Let it be our aim and pleasure to do whatever we can to multiply such homes, until every husbandman shall cheerily sit under his own vine and fruit-tree, and none shall make him afraid.

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* The gospel of the Prince of peace, having failed in its appeals to moral sentiment, to put an end to war, possibly the perfection of firearms, making war fatal to nearly all who fight, and thus appealing to human cowardice, will prove the great pacificator of the world.

SECOND DAY.

The Board met at nine o'clock, vice-president Hyde in the chair. The first matter upon the programme was a lecture upon

THE LAW OF ROADS AND BOUNDARIES.

BY SIMEON E. BALDWIN, OF THE NEW HAVEN COUNTY BAR,

Professor of Constitutional Law, and the Law of Contracts and Wills, in Yale College.

It is a very common mistake, Mr. Chairman and Gentlemen, to suppose that the public roads are owned by the town, and you will pardon me perhaps for saying a word or two in the first place upon that subject. A town, by our Connecticut law, does not own anything in a highway. The public own the right of passing over it, and the soil itself belongs to the owners of the adjoining land just as much as the adjoining land belongs to them. They own on one side of the fence just as much as on the other. If there are fruit trees on the highway in front of your farm on your side of the middle of the road, they belong to you; the fruit belongs to you and the timber belongs to you; the grass upon it belongs to you; and if you cultivate a patch of it, the crops you raise upon it belong to you.

Ordinarily, when you deed a piece of land, whether it be a farm or a city lot, and bound it on the highway, it carries to the center of the highway; the law implies this; but it is very easy, of course, by the change of a word or two, to alter that and to limit the deed to the line of the highway; and, if you do that, the deed does not convey any part of the highway; it remains in the man who gives the deed, and he can deed it to somebody else. If I gave a deed to-day of a piece of land, and bounded it north by a line running along the southerly edge of the highway, it would not convey the high way; but half of the road, between the south line and the center of the highway, would belong to me still. I could sell it to somebody else, or I could use it myself, for many purposes. If it were a city street, it might have considerable value, as for instance, if I were to dig vaults or a cellar underneath the highway. I should have a right to do this, if I owned the soil.

Take, then, gentlemen, this general principle, that towns have no property in highways; but they have very important rights over them and very important duties in respect to them. Towns, for instance, can build and repair highways and must do so. If an accident happens upon a highway from the failure of the persons or corporation, whose duty it was to repair it, to do so, the town or corporation, as you all know, must pay damages. In old times, a century ago, they used to have to pay double damages; now they simply pay actual damages. Towns also can make certain by-laws in regard to sidewalks on public roads, if they choose to do so.

But although the towns are under the burden of making and repairing highways, they have not the power to lay them out. Towns do not lay out our highways; the selectmen do that, or the courts. The selectmen act, not as agents of the town, but as agents of the law or of the legislature,—as the agents of the State.

Our present mode of laying out roads is just about one hundred years old. It took its present shape about 1773. Before that time the selectmen had nothing to do with roads from town to town; but for the last century, the law has been about the same, as far as the laying out of highways by selectmen at the expense of the town, and by the courts, is concerned.

There is another way in which a large part of our highways are laid out, and that is by dedication,—by gift on the part of the proprietor. If a man throws open his land for a highway, with the intention of making a highway of it, and the people use it for a reasonable length of time, it becomes a highway just as much as if the selectmen laid it out, or as if the court did. Such a highway as that, if the public accept it and use it, the town will have to repair, and if any accident happens upon it, the town will have to pay damages.

The obligation of towns to make roads and to repair roads is such an ancient one, that we are apt to think that it belongs to the idea of the town. In the very first printed edition of our Statute Laws, published in 1673, it was laid down that towns were bound to be at the expense of making roads, and of repairing unsafe roads and bridges; and that has been the law ever since. But it is merely a matter of statute law—a thing that the legislature can unmake. If the legislature saw fit, next May, to pass a law, that the *State* should build and repair all the roads within its limits, or that the County should or the County Commissioners, the towns would have no further liability. It is only a statutory regulation, which the legislature can wipe out any day they please.

The fact is that we have a great many false ideas about towns in this State, for the reason that our town law has not changed very much during the two hundred and fifty years of our existence as a State or Colony. But towns have really no inherent rights, and no inherent obligations. They are simply the creatures of the legislature, and the legislature may give them just such powers and just such obligations as it sees fit. You all know how common it is for the legislature to take a town and divide it, against the will of the old town. Look at the case of Thomaston and Plymouth. Year after year they fought out their battle in the legislature; a very large sum of money was used in lobbying; and finally the division was obtained against the protest of the old town. If the legislature can do that, it can do anything, and it does do anything that it pleases in regard to the rights and obligations of towns.

An accident sometimes occurs on a road because some private individual has put an obstruction there. In such a case as that, you can generally hold either the town or the individual liable. You can hold the town liable, if it ought to have known that the obstruction was there, and did not remove it; and you can hold the individual liable anyway. Of course lawsuits for such damages are generally brought against the town, because the town is always pecuniarily responsible, while the individual may not be.

Now it is a very common practice, as you all know, upon the farm, particularly if the farm-house is near the edge of the highway, to have the wood-pile upon the road side, near the kitchen gate or door, and the chopping-block and axe there. Suppose somebody comes along on a dark night, and runs over your wood-pile, strikes his foot against the axe and cuts it: you are liable for the injury, because you have obstructed the highway; and if you have kept your wood-pile there so long that the selectmen ought to have known it, and to have had it removed, the town would be liable. You are at the mercy of the jury. If the jury think it was an unreasonable obstruction of the highway, you or the town have got to pay the man's damages.

There was a man in Branford, some years ago, who left a load of wood over night in his cart in front of his farm. He had an enemy who wanted to play him a trick, and who hauled the cart during the night into the middle of the traveled way. When the man got up, he found his wood tipped out of the cart into the middle of the road. He knew very well who must have done it, and said "Let him fix it. I won't attend to it," and left it there. It was there two or three days, and the third night somebody was driving along in the dark, and ran into the pile of wood, and was very much injured. He brought his suit and recovered very heavy damages against the man who owned the cart—not the man who did the mischief. The court said, "Your cart had got into the middle of the road; no matter who put it there; you knew it was there and you were bound to remove it, and if you did not, you are liable to any party who is injured."

A great deal of trouble sometimes arises from the grading and re-grading of roads. A man owns a house situated on a gradual slope—a high grade—and the town comes along and cuts down the grade ten feet, if you please, below his front door, so that he must build a flight of steps to get down to the street. He cannot recover anything from the town. The town has a right to grade and re-grade the highways just as much as it pleases—grade them up or cut them down. If you buy a house on a hill, you buy it knowing that the road may be cut down; it goes into the estimate of the land damages, that is made when the road is laid out, the damages that may arise from cutting it down. That is the theory of the law, though perhaps the assessors never thought of it, and so the town may grade and re-grade the highways without paying any further damages. A *town* may do it. A railroad or private corporation cannot, but a town may, as the agent of the law.

There are statutes in very many States which prohibit this. We had one for a few months, but it has been repealed. In Massachusetts, the law is, that if the grade of a highway is changed by the agents of the law, those who change it, the town or city, must pay just damages to the party injured, and assess just benefits to those benefited; for of course, if you grade down a hill you grade up a valley, and the benefits ought to be off-set against the damages. I think our law ought to be changed in that particular.

A large part of the highways in our State are fenced on very different lines from those of the real lay-out. Occasionally, they are wider than the lay-out, but generally they are a good deal narrower. Now, you all know that fifteen years adverse possession of another man's land gives you, practically, a title to it: that is to say, it warrants the presumption that you must have had a deed of it originally, or else he would not have lain quiet so long, during that fifteen years. Practically, I say, fifteen years adverse possession of another man's land gives you a title to it. But it is not so with enclosing a portion of the highway with your fence for fifteen years. It must be a good deal longer time before you can oust the public of their right to use the land, that you have enclosed, for highway purposes. Precisely what time is necessary has never been fixed by our courts, but in one case they held, I think, that ninety years was enough, and any very long time would be enough to give a title to the highway at common law. We have a special statute preventing such titles from growing up in regard to railroad or canal lands. The reason why more time is allowed to the public before they lose their rights to highways, than is allowed to individuals before they lose their rights to their farms by adverse possession, is, that "what is everybody's business is nobody's business." It is not of very much consequence to me, as a citizen of New Haven, whether a particular man has enclosed ten feet of the highway or not: there are sixty thousand people there, to each of whom it is of as much importance as to me. Therefore, being nobody's business in particular, it passes along, and there ought to be more time given to have somebody start and get the grand juror to prosecute, and remove the fence.

There are a great many private roads in this State that have been gained by fifteen years use,—fish roads, wood roads, roads to salt meadows, etc. Fifteen years' adverse use of a way like that, will give a title to hold it forever. You must have a particular kind of adverse use. It must be open, not secret, notorious, public; not by leave or license of the man who owns the land; it must be continuous; and it must be under a claim of right. No matter whether you *had* any right or not; but you must *claim* you had a right. If all that is true during fifteen years, if you have been going over your neighbor's land to your wood lot beyond, you and your heirs have a right to go over that land, in the same way forever. You have acquired that right by adverse use, or by "prescription," as lawyers say. It is not necessary that the use should be continuous, every day in the year. Suppose you own a wood lot on the mountain, and your neighbor owns the land between your farm or the highway and that wood lot, and you have been over his land every winter, or every other winter, as often as you have had occasion to haul wood from your lot; that gives you the right to use that way as freely as if it were a public road, as often as you have occasion, in the same way. If, therefore, you did not have occasion to cut wood more than once in two years, you have acquired the right to go over it once in two years for all time. And if you have been over it fifteen years, but only twice a year, because using it twice a year was enough, that gives you the right every year to go over it as often as is necessary for your purpose in cutting that wood. Farmers who live on the shore know very well how many roads there are of this character going down to salt meadows. You go down there and cut your grass, stack it, and when the time comes, you haul it in. You have occasion to use the road only two or three days in a year; but if you use it two or three days each year, during fifteen years, openly, under a claim of right, not by leave or license, you acquire the right to use it in the same way forever—you and your heirs.

Now, a word or two in regard to another kind of ways—*ways of necessity.* If you deed a man a lot which is bounded on all sides by your own property, the law does not think it reasonable to suppose that you meant he never should get to the land you deeded him, or never get to it except by trespassing upon you, and consequently implies a right in him to go over your land to get to the lot you sold him. So, if you sell the front of your lot to me, and reserve the rear, you must have the right to cross my land in order to get to yours, because, otherwise, you trespass upon my land, and the law implies that right in your favor. It works the same the other way. Suppose that I own this hall, and I sell to somebody so much of the hall as lies between that aisle and the street. I have no means of getting to the street after that except over that part, and the law gives me that right. It is a way of necessity. If I am blocked up from getting to the street by the land I have sold him, the law implies that I reserved the right to go over that land to the street whenever I want to go over it. That is a way of necessity. But that way ceases whenever the necessity ceases. If there should be a highway laid out to this insulated back land, then the way of necessity stops, because I have got a highway, whether it is as convenient as the old one or not.

There are a great many rights of way reserved by deed,—expressly stated in the deed. A man gives a deed of a farm, reserving a wood road to a certain wood lot adjoining, to himself and his heirs forever, as appurtenant to that wood lot. It does reserve it forever, to himself and his heirs. There is a great deal too much carelessness in drawing deeds of farms in respect to that matter. Probably five *per cent.* of the farms of this State are encumbered by old rights of way that have been reserved by deeds, some of them an hundred years back, and when a new distribution was made, they did not take the trouble to look at the old records, but gave warranty deeds. There may often be trouble in such cases; because, if there is a right of way, it breaks the covenant; you cannot give a warranty deed of land over which there is a right of way, acquired by a deed fifty years back, without excepting that right of way; so that, those who don't want to pay damages for the existence of such rights, ought to take more care in searching records when they give deeds of farm lands.

A word or two now in regard to a kind of way that used to be very common with us—the turnpike. There are still nine turnpikes in the State. Early in this century there were over sixty, with a capital of about three-quarters of a million. It was a great interest, fifty or sixty years ago. My grandfather owned sixteen or seventeen shares in a turnpike, for which he paid $200 a share. When they descended to his grandchildren, they were worth $10; now they are worth nothing. That is the way things alter, of course. But there is a good deal of law about turnpikes still, because, as I say, we have got nine of them, and we have a great many roads which used to be turnpikes, but have become, by the discontinuance of the turnpikes, highways again. The legislature, in many instances, laid out turnpikes over existing public highways, or in part over existing highways. Whenever that was done, the burden of repairing those old roads, now made part of the turnpike, and, of course, of answering for the damages, if accidents occurred upon them, was transferred from the town to the turnpike company. Now, whenever the charter of a turnpike company owning such a road is repealed, the liability of the town revives, and it must answer again for the repair and keeping up of so much of the old road as existed before the turnpike was made a part of it. But here is, you must bear in mind, a very important distinction. If the turnpike company simply opens its gates, and abandons its road, so to speak, and does not do anything more, then the town is not liable. Why not? Because, by the statute (as I say, the liability of the town is a mere matter of statute) the town is only liable to repair roads, when nobody else is liable to repair them. If there is a turnpike company in existence, although it is not worth a cent, still that is the "person" liable to repair that road. There have been a great many cases of that kind in this State where turnpikes have been given up. The stock has gone down to nothing; they have opened their gates so that every one could pass free; the roads have got into bad repair, and people have been injured; and nobody could be held to pay for it. They could not make the town pay, because the turnpike company is liable to repair the roads, and therefore the turnpike company is the party to be sued; but the turnpike company has no money.

A corporation never dies, and there is no way by which a corporation can become extinct but by the death of all its members, or by a repeal of its charter by act of the legislature, or by a surrender of its charter to the legislature, or a decree of court. Very few turnpike companies have gone through that process. They are alive still, as corporations, and therefore a good many of these roads are roads which turnpike companies are bound to keep in repair, and if there are accidents upon them, the turnpike company must answer for them, and therefore the town need not. When a turnpike company gives out and gives up in that way, the County Commissioners or the town (there is law enough if it is carried out) can take such official action as will make the roads public town ways and throw the burden upon the town of repairing them.

Turnpike companies, like towns, have the right to take stone, earth, and timber, from the turnpike, for the purpose of repairing any other part of the turnpike, doing it reasonably.

So much for roads. Now in regard to boundaries. There are two principal objects in fencing or enclosing a man's land; one is to prevent injuries to him by other people's cattle, and the other is to prevent injuries to other people or to other people's cattle by their straying in. Fencing on the highway, therefore, ought to be so substantially done as to prevent travelers or cattle from straying into your enclosure, and from being injured if they so stray in. The law is pretty strict on that subject. There was a man in Litchfield thirty or forty years ago, who was a victim to a case of this sort, or thought he was a victim. There was a sort of pass-way that led down from his farm-house to the highway, and at one point on this pass-way he had a large gate, which was not very strong. On this same pass-way or farm road, there were some tenement houses, and the children swarmed out there and played on the gate. One little boy of six shook it with his hands, one day, when he went out, and when he came back he shook it again, and it fell down upon him and broke his leg. The man had to pay for breaking the leg of the boy, because the gate of his farm road leading down to the highway was not strong enough to prevent a child of six years from shaking it down upon himself.

There was a man in Norwich who dug a cellar a few years ago, for a new building, some four or five feet from the street line, and then took away the fence, in order to haul in his foundation stone more conveniently. He left the fence down over night, with no light, and somebody, walking along the street, strayed inside of the line, fell into the cellar and was injured. That man had to pay the damages. He had no business to remove his fence in that way, so that travelers could stray in where there had been a fence before, without giving reasonable notice of the danger, by a barrier or lights.

In regard to fencing against cattle, by the common law of England, from which all our common or unwritten law, our law which is not statute law, comes, nobody is obliged to fence in order to give him a claim for damages if animals trespass upon his land. That is the English common law. The reason is, that in England they have very little wood and very little stone that is cheap enough to be used for fencing purposes. Men cannot afford to fence there, and their husbandry is carried on in large fields. There are very few States where they have such small farm fields as we have in Connecticut. I was in Delaware last week, and was told that there they hardly ever enclosed less than thirty acres in a farm lot. The enclosures we make in New England cost a great deal more money than most people think. It has been estimated, I believe, that one-quarter of the value of all the New England farms is in the fences; or, I might better say, a quarter of the cost of all the farms, counting in buildings and everything, on the average. But in Connecticut our statute has changed the common law. By our statute you cannot claim damages, generally, for trespasses by your neighbor's cattle on your farm, unless there was between you a lawful, sufficient, divisional fence, a sufficient fence to restrain ruly cattle, ordinary cattle, or unless the cattle that trespass upon you are so unruly that their owner was bound to fence them in at his own risk. Now what are such unruly cattle? The Supreme Court had occasion to pass upon that question not long since, and decided what, under Connecticut law, are "unruly cattle," that the owners are bound to fence in at their own risk. Unruly cattle are such as will not be restrained by *ordinary* fences. What does *ordinary* mean? It does not mean a lawful fence. You know a lawful fence is fixed by statute. It is a stone fence, so many feet wide and high; a post and rail fence so many feet high; a ditch of a certain width, and so on. That is by statute law a lawful fence; but an *ordinary* fence is something very different. I do not suppose that half or a quarter of the fences in this State are *lawful* fences. Perhaps they were lawful fences originally, but they have settled, or decayed, or the top layer of stones has fallen down: still they are *ordinary* fences. Now, it is that kind of fence that I mean, when I say that unruly cattle are such as will not be restrained by *ordinary* fences. They may be lower than lawful fences, but if cattle are so unruly that they will get through such fences, their owner must take care of them.

In setting division fences between adjoining proprietors, the statute requires the center to be on the boundary line. That gives you the right, if you are setting a division fence, to go upon your neighbor's land for that purpose. If you are building a stone fence, three feet wide, and it is to be half on your land and half on his, of course you can go on his land to dig your foundation, and set your stone; it is not a trespass. If it is a post and board fence, the law is so construed, as most of you know, as to require the posts to be on one man's land and the boards on the other man's land. That is, the dividing line is to be the line between the posts and the boards;—not the center of the fence. I have sometimes thought that our law was not as sensible on this point, at least in regard to farm fences, as the old law which they had in Rome, a thousand or two thousand years ago. There, if a man wanted to build a stone wall, he could not build it within a foot, I think it was, of his neighbor's line; and they avoided a great many lawsuits about boundaries by that provision.

In regard to fence-viewers, it may not be generally known that the selectmen are now the only fence-viewers. Since the recent revision of the statutes, fence-viewers, as such, have gone out of existence. There are no fence-viewers but the selectmen, and it is made their duty now to view fences.

Where a brook, or a river that is not navigable, is the boundary between two tracts of land, each proprietor is presumed to own to the center of the stream;—not to the center of the channel, but to the center of the stream. It follows that each proprietor has, on his side of the brook, the exclusive right of fishing in that brook. Fishing in navigable rivers or waters, or on the sea, is common to everybody; unless there has been some special title acquired by prescription or by grant from the State, which is not common; but where you come on narrow, non-navigable streams or brooks, the proprietors on each side have the exclusive right to fish. If anybody comes along in a boat and fishes, he trespasses on the proprietor whose land he is the nearest to. Very often, as you know, the soil is gradually washed down from one part of a brook to another, and it forms a bank, or widens out a bank on one side. Such soil as that belongs to the man against whose bank it rests; his bank is increased just so much.

Where you are bounded on a natural pond, your boundary generally carries you only to low water mark; that is, to low water mark in summer; down to the point where the water is when it is lowest. But if you bound on an artificial pond, on a mill-pond, and your deed bounds you on the pond, it carries you to the middle of it. What is the reason? An artificial pond is a mere widening of the stream. As I said a moment ago, when you are bounded on a small stream, you go to the middle thread of the stream. If you bound on a stream that has been widened, the same rule applies—you bound on the middle. If you bound on a lake, or on a natural pond which has not a natural current, there the law is different. There you have a pond of water that is valuable for fishing and for ice; and the consequence is, if you want to convey the water, you must convey by your deed so much of the bed of the pond as is bounded so-and-so; the whole of the bed, or half of the bed, or a quarter of the bed, as you please to describe it. Then the purchaser will have the right of fishing in that pond, and he will have the ice, for the ice in a natural pond belongs to the man who owns the soil beneath it.

I may say, in passing, that if you are bounded on a brook, you have the right to use so much of the water of the brook as is reasonable for your household purposes, and for your stock, and for irrigation; but you may not use so much as essentially to injure your neighbor who owns below you, and who has been accustomed to use the water for some beneficial purpose. The maxim is, that the water ought to run as it has been accustomed to run. It does not mean that you cannot diminish the supply of the proprietor below somewhat; of course you must have your share of it for irrigation, for watering your stock, for culinary purposes, etc.; but you have no right to divert so much of it as essentially to impair his rights.

A building is sometimes put on the boundary line, and so serves the place of a fence. If the sill of your barn, for instance, is on the line, and the eaves project over your neighbor's ground, that projection of the eaves invades his right; because every man, who owns soil, owns up to the heavens and down to the center of the earth; and if he owns up to the heavens, and strikes your eaves, your eaves impeded his right. Of course, if his eaves are over your land, there may be a dropping of water on your land, and if that dropping continues fifteen years, it may give him the right to keep them over your land forever, on the principle to which I alluded a few moments ago in regard to rights of way acquired by adverse use. Just so, if your house is on the line, and your blinds swing over your neighbor's ground, if they swing so for fifteen years, it might give you a right to have them swing over his ground forever. It is a right acquired by adverse use. The only proper way to avoid trouble, in a case like that, is to have a little writing, signed by you, saying that the blinds swing over your neighbor's land by his leave and license, or that the water drops on his land by his leave and license. Then it is not adverse; it is not under a claim of right. That writing will make him all right, if the matter ever comes into court. Or, you may get a lease for a nominal rent of a cent a year, or no rent at all, and put it on record. Either of these ways will answer the purpose. Or, if you don't care about seeming unneighborly, if anybody's eaves come over your land, you can cut them off; but your neighbor will probably think you are rather hard.

No man has a right to put any dangerous or unwholesome thing on his boundary line, where it annoys his neighbor. You cannot put a pig-sty under your neighbor's window, for instance. If there was a pig-sty there when he built, that is a different thing. He built then near the pig-sty; you did not build the pig-sty near him. In one case, a man put up a hay-rick on the edge of his land, right by his neighbor's house. He left it so carelessly that the hay caught fire by spontaneous combustion, and set fire to his neighbor's house, which was consumed, and he had to pay the whole bill, because he had abused his own rights. The maxim of law is, you must use your own rights so as not to injure your neighbor. "So use your own as not to injure anybody else." If you are in doubt about the law, go by that maxim, not to use your own property so as to injure anybody's else property, and you will generally come out right.

Suppose you put up a building on the line, and afterwards the adjoining proprietor who owns next to you, wants to build, too, and wishes to dig a cellar. A difficulty will be very likely to occur then, because, as he digs his cellar, your house and its foundations will be apt to cave in, unless something is done. The rule of law on that point is, that no man has a right to dig a hole on his ground so near his neighbor's land that any of his neighbor's soil will fall into the hole by its own weight. But if it does not fall in by its own weight, but because he has put a heavy building upon it, which crowds or presses it down, then the man who digs the hole is not responsible for the fall of the house, provided he gives fair notice, so that the other may shore up his house. If my neighbor digs a hole, and I have put up a house which is so heavy that it forces the soil down into the hole, my neighbor, although he has done me damage by digging the hole, has done me no *legal* injury. My duty was to shore up my house; and his duty was to notify me that he was going to dig the hole. Or, if I saw him digging the hole, then I had full notice, and should have shored it up.

Fruit-trees very often grow on the border of a man's garden or orchard, so that the fruit will hang over the fence. The same law, that governs in the case of eaves, applies there. If my neighbor's apple boughs hang over my land, it invades my right to make my way up to the heavens. I can cut them off, but after I have cut off the boughs, I cannot burn them up for fire-wood, and I cannot eat the apples. If the apples fall on my ground, I cannot eat them, although the common impression is the other way. The fruit belongs to the man who owns the trunk of the tree, and the trunk of the tree is owned by the man in whose soil it leaves the ground. It is of no consequence where the roots extend; it is of no consequence where the boughs are; the fruit of the tree, the wood, and everything, belongs to the man who owns the trunk; and the man owns the trunk who owns the soil where the trunk leaves the ground. If the trunk is on the dividing line, the tree is common property; but if the trunk of the tree is on my land, I own the tree and the fruit, although the fruit may be all on the other side of the line. That does not imply that I can go on my neighbor's land and pick the apples. I must crawl up the trunk, and if I darken his ground in doing so, cut off the air, or keep the sun from his ground, he can sue me, and get one cent damages. Of course, you have got to "live and let live" in these matters; but the cherries, or the apples, or whatever the fruit may be, belong to the man who owns the trunk, and the only neighborly way is to let him come in and get them.

A boundary line is sometimes described in a deed in several different ways. You want to make it plain, so you will describe it first sufficiently, and then describe it insufficiently. That is a very common way. It is very common to say, for instance, that the boundary of a farm begins at a white oak tree, and runs due east to a stake and stones. Very well, that is enough. If there is a white oak tree, and a stake and stones due east from the trunk, you have done everything that is necessary. But that is not enough, you think, and you go on and describe it by distance, and say it is 150 rods. Now, suppose it turns out by measurement only 100 rods, there is a difficulty; something to be reconciled. The principle of law on that point is an important one, which I will mention before closing. It is this: *Known and fixed monuments in a deed control courses and distances.* That is the legal phraseology. It means, in the case I put to you, that the white oak tree, and the stake and stones, are known and fixed monuments. They are there; you cannot mistake those; they are in a line due east; first the white oak tree, then the stake and stones. They control the distance. The deed says 150 rods. If it is 200 rods, you take the whole; if the distance is only fifty rods between them, you only take that. Although it may have been described as 150 rods, that was a mistake. Known and fixed monuments control courses and distances.

I will mention one other thing, and then I shall be through. It is this: You know there is a provision in our statutes to settle lost or uncertain boundaries, by going to the Superior Court and having a committee appointed to go out and fix them. It is very commonly thought among our people, that that is a way to settle boundaries between adjoining proprietors. Not at all. That is merely a proceeding to restore lost or uncertain boundaries that once existed. Unless boundaries existed, there is nothing to restore. And what is more, if boundaries did once exist, and if you go to the court and get out your committee, and have them restored, after all, you must still bring an action of trespass or ejectment, and try your case before a jury, before you can get possession, if your neighbor does not acquiesce. When the committee have restored the lost and uncertain boundaries, they have simply restored certain evidence by which you can prove to a jury, at some future time, that you run up to those boundaries; that is all. Therefore, if you have a dispute about the title to land, you cannot settle it in that way.

Mr. T. L. **Hart.** I wish to inquire if adjoining proprietors are obliged to keep a front fence to keep stray cattle from running into their enclosure?

Mr. **Baldwin.** The rule applies that I mentioned a few moments ago, that except as to cattle which are at large contrary to law, you are obliged to fence in such a way as to keep out ruly cattle, not to keep out unruly cattle. Suppose somebody's animals, as he is driving them along, get into your field and eat your corn; you cannot, as I understand it, sue him for damages unless your fence was a sufficient one. You may be able to impound them, and to hold on to them till the damages are paid; but this gives you, I think, no right to sue for damages from the owner. So if the damages exceed the value of the cattle, you have no remedy for the excess; your only right is to impound the cattle, and claim your lien under the statute.

Mr. T. L. **Hart.** Suppose a building stands close on to the adjoining proprietor's line, and the owner of the building is putting on his roof, can he set the foot of his ladder on the adjoining proprietor's land?

Mr. **Baldwin.** No, sir, unless by his leave and license. The proprietors of two newspapers in New York had occasion to test that question there—the "Tribune" and "Sun," I think. The proprietors of one of the papers wanted to paint their building, and could not do it unless they put the ladder on the ground of the proprietors of the other paper. The two papers had quarreled, and the proprietors of one would not allow the others to put a ladder on their land, so they let the painter down on a scaffolding. Then the foreman of the other paper went out and pushed off the scaffolding, as it hung down, with the end of a plank, so as to swing it back around the corner away from its position over the "Tribune's" land.

The revenge of the other paper was to bring out a photographer and have him take a picture of the foreman of the "Tribune," while doing that.

Mr. T. L. **Hart.** It has been generally understood, I believe, by our farming community, that the highway, to all intents and purposes, belonged to the adjoining proprietors just as much after it was laid out as before, except that the community have the right to travel over it, unless the owners of the land conveyed it by deed.

Mr. **Baldwin.** Yes, sir, that is exactly it.

Mr. T. L. **Hart.** Then, if cattle trespass upon his highway, he can shut them up in his own yard, or put them in the public pound?

Mr. **Baldwin.** He cannot get any damages from the owner, except under the impounding statute, or when the owner is unlawfully using or pasturing them there.

Mr. T. L. **Hart.** He could get the fee for impounding?

Mr. **Baldwin.** Yes, sir.

Mr. **Clark.** I believe you said that the law by which a man could obtain damages for the grading or regrading of a road has been repealed. Is there any power that would restrain the authorities of a town, if they were grading a road to the injury of the adjoining proprietor? Could they be restrained by an injunction?

Mr. **Baldwin.** Not unless they were doing it wantonly or maliciously. A very strong case would have to be made out to obtain an injunction.

Mr. **Clark.** Even if they were injuring the proprietor seriously, an injunction would not lie?

Mr. **Baldwin.** No, sir. There was a case of that character in Boston many years ago, where the authorities graded down Beacon street, I think it was. There was a handsome residence that stood on the hill twenty-five feet from the street, and it was left in such a dangerous position by the cutting down of the street that it was liable to fall over, but the owner could recover no damages from the city. So the legislature of that State passed a law providing for the assessment of damages in such cases.

Mr. **Augur.** I would like to ask this question: Suppose Mr. Rockwell, for instance, of this place, spends fifty dollars in setting out ornamental trees in front of his land, and some cattle, which are at large in the streets, damage him to the amount of fifty dollars by destroying all his trees, can he recover damages from the owners of the cattle?

Mr. **Baldwin.** My impression is, he cannot, unless the owner is negligent in letting the cattle go off alone, and yet, I have never known a case of that kind tried. We have a statute which says that any person who injures a tree shall be punished, and we have a statute which authorizes the selectmen to allow a man to set out trees in front of another man's land, and it provides that, if they are injured by any person, he shall be fined.

Mr. **Rockwell.** Suppose a town, in grading down a roadway on the side of a hill, to make a good drive way, is necessitated to cut out a high bank, is it liable to put in a retaining wall, to prevent the ground from caving on to the road-bed?

Mr. **Baldwin.** There is some difference of opinion about that. In New Haven, that has sometimes been done by our authorities, and sometimes not. They are bound to act reasonably about it; and what is reasonable in different cases will be judged differently.

Mr. **Rockwell.** That is a case that arises very frequently in our side-hill towns. It is almost impossible to grade a road along a steep hill-side, unless you cut in pretty well up to the line, and as a result, the land of the adjoining proprietor falls, by gravity, upon the road.

Mr. **Sedgwick.** Has a town any right to discontinue a public road?

Mr. **Baldwin.** Certainly. That is, the selectmen have the right, with the approval of the town, if it is not a highway laid out by the legislature or the courts.

Mr. **Sedgwick.** If they so discontinue a road, does the proprietor of the land on that road lose his right of way to his land? For example: I have a road in view which has been discontinued as a public way by the action of the town. Between my land and the end of the road there are several proprietors, whose land runs clear across the road. Now, my question is, can they fence that road, and deprive me of a way to my land?

Mr. **Baldwin**. Yes, sir, I think they can, because their rights revive, the way being extinguished. If you want a road, you must appeal to the Superior Court, or else go to the selectmen and ask them to lay out a private way; or you may have a way of necessity, according to the principle I stated a few moments ago, if you bought your land originally from these other proprietors.

Mr. **Sedgwick**. Suppose there was an old way which was laid out by the County Commissioners, and which was discontinued for this other road, to make an improvement, could I open that old highway, for instance, to my land?

Mr. **Baldwin**. Now you have a case where there was a town way laid over a court highway. It is rather a singular state of things to have a town way laid over a court highway. I am afraid it was not very regularly done. I am rather inclined to think if the town way is discontinued, the court road would revive. I doubt if the question has ever been distinctly decided.

Mr. **Sedgwick**. In regard to this road that has been discontinued, I am under the impression that it was laid out by the County Commissioners,—by the County Court. If the discontinuance of it deprives me of my right of way, I do not know what to do.

Mr. **Baldwin**. You must go to the selectmen and get them to lay out a private way. The statute allows that. If it was laid out by the *court*, however, the selectmen have no right to discontinue it.

Mr. **Rockwell**. Has a town the right to discontinue a court highway?

Mr. **Baldwin**. No, sir; it is beyond its jurisdiction.

Mr. **Avery**. If a gentleman purchases land in any community, lays out his grounds, puts up his buildings, and then throws open his gate or gates adjoining a public highway, who is responsible if cattle go through the gates into his ground? That is my question, sir.

Mr BALDWIN. Has he got his gate there?

Mr. AVERY. Yes, sir, his gate is there, but he leaves it open day after day.

Mr. BALDWIN. It strikes me that the principle would apply there, that the man is bound to fence.

Mr. AVERY. He neither could impound them, nor in any other way molest them?

Mr. BALDWIN. I think he could impound them, but he could not claim damages from the owner, by *suit.* The point is here: you cannot sue the owner unless the injury was due to his negligence; but if the injury could not have happened except from your neglect to fence or to keep your gate shut, then the injury is partly due to *your* negligence, and a man cannot sue another for damages due in part to his own negligence.

Mr. AVERY. What satisfaction would he get from impounding them?

Mr. BALDWIN. Very little: only what the statute gives him. He must close his gates if he wants to protect his property. If a calf, worth $10, tramples down flowers worth $100, the statute gives a lien on the calf up to his value, but I don't think you could make his owner pay the $100.

Mr. AVERY. Who pays the expense if he does impound them?

Mr. BALDWIN. Their owner must pay the expense.

Mr. AVERY. These are trifling matters in some respects; still, they may grow into something serious. The circumstances are such, in many localities, that it is sometimes very necessary to understand what is lawful, and what are a man's rights, and what are not.

Mr. BALDWIN. You will find in the Revised Statutes pretty plain rules on the subject of fences, and on the subject of impounding. All the law there is about impounding is in the Revised Statutes.

Mr. **Goodman.** If that is the law, Mr. Baldwin, is it not one which, in the interest of farmers, ought to be abrogated? We have a law in Massachusetts by which cattle owners are compelled to keep their cattle upon their farms or grounds, and they have no right to let them go upon the highway unless attended by a keeper, and then the question would arise whether the owner would not be liable if they got upon my land. Cattle are continually driven from Vermont and other places over our highways, and the law is, that the men are bound to take care of their cattle; they are bound to have somebody ahead to shut the gates, and keep the cattle from straying on to private grounds. This matter of the obligation of the drivers of cattle to take care of them has become of consequence, because farmers are becoming satisfied that fences are a great expense. A great many farmers in my region do not have any front fence at all. I assume, therefore, that they have taken advice, and believe that the law does not require them to maintain fences along the highway. Very likely the law is different here. You have adhered, perhaps, to the common law. If that is so, the quicker that law is abrogated the better, because the quicker we can get rid of fences, the better it will be for us. We want fences to keep our cattle in; we do not want them to keep other people's cattle out.

Mr. **Avery.** It is getting to be quite fashionable, in some localities in the State, to build no fence at all, or, if there is a fence, the gates are allowed to stand open for weeks, perhaps months. Now, sir, according to your interpretation of the law, if anybody was so disposed, he could let his cattle run at large, and do a vast amount of damage, and he would be liable simply to the trouble of driving his stock from the pound.

Mr. **Baldwin.** Yes, sir, but he would have to pay the poundage fees, and the damages, when given by the statute, before he could get them.

Mr. **Avery.** It might be a mere pittance in comparison with the damage committed.

Mr. **Dayton.** I have understood that a man's barn-yard was a legal pound; that he was not obliged to drive cattle to any town pound, but could drive them into his barn-yard, and collect the regular poundage fee. Is that the case?

Mr. **Baldwin.** The selectmen can make pounds where they please, but a man's own barn-yard is not a pound.

Mr. T. L. **Hart.** I think there is such a statute as that.

Mr. **Baldwin.** It is possible there may be. If so, it has escaped my notice.

Mr. **Moore.** Has a town a right to discontinue a way on which inhabitants are living?

Mr. **Baldwin.** Yes, sir. That is, the selectmen have, with the approval of the town.

Mr. **Moore.** Are not those inhabitants entitled to damages?

Mr. **Baldwin.** I do not recollect any statute which gives them the right to recover damages; yet there may be.

Mr. **Moore.** But it is a great damage to them.

Mr. **Baldwin.** Undoubtedly. They must appear in town-meeting and oppose it. It may be there is a statute which allows damages. I never like to answer any question upon the statutes unless I have the book before me; but I don't recollect any such statute.

Mr. T. L. **Hart.** I have tested this matter in the town of Sharon. I found in that beautiful street as many as fifteen cows, sometimes; and of course I need not say they were unruly, for every farmer knows that cattle which run on the street will get unruly. We were so situated, having a physician boarding at the house, that we were liable to have the gate left open at night. I wanted to ascertain whether the inhabitants on that street would sustain any one who would carry out the provisions of that law, and I could not find one man on the street who would take hold of it. I gave notice in the papers that all cattle found running in the highway would be driven to the pound. It was a pretty hard place to put a man in who had just come into the town. Even the adjoining owners would not take hold of it. One of the signers of that paper said, "I will send one of my men to drive the cows into the pound." I told him I thought it was not best to have any boys' play about it, and I would go with them. So we took three cows that were running in the road, and drove them to the pound, and every cow that came into the street was driven to the pound or into our own yards. I said to the men, "It is not a matter of money, but I want those cattle kept out of the street." I believe the law allows twenty-five cents for an animal put in the barnyard, and fifty cents if it is driven to the pound. There was one man in town, worth $60,000, who would get up at three o'clock in the morning and turn his horse out on the highway, and just about the time people were getting up, he would take him in again. Well, one night I took this horse and a cow that had destroyed a garden the year before, and tied them up together, and about day light the owner of the cow came to the house. I saw him coming, and asked him in. Said I, "You are interested in this street, and how does it look to see it smeared with the droppings of these animals, and the city boarders trailing their dresses over them? I don't want your money, but you must restrain your cattle. Here is the very animal that destroyed a garden last year,—will you take care of her?" "Yes," he said, "I will take care of her." When the rich man came for his horse, I had the same kind of talk with him. I said, "I don't know how many of my boarders will call for their bills in the morning in consequence of this horse coming in front of the house and blowing his nose, and disturbing their sleep." He kept hauling out his twenty-five cents. "No," I said, "I don't want your twenty-five cents; it is not a matter of money, but my gates are liable to stand open at any time, and I want you to keep your horse out of the street." He took his horse away, and I have not been troubled by him since.

One Sunday morning, I found two cows in my garden, that belonged to an Irishman who had raised them on the highway, and drove them to the pound. I met the man coming up to the house and said, "Your cows have been in my garden, and I want you to pay me damages." He raised his fist, and threatened to kick me out of the town. I said, "It is Sunday morning; I will see you the fore part of the week." Early in the week, I entered a complaint, and a writ was served upon him. I told him, "I will settle with you for five dollars." One of the lawyers in town volunteered to manage the case free of charge. He paid over the five dollars, and then said he would "put me through," &c. Somebody had put it into his head that there was a law against compounding felony, and that the penalty was pretty severe. Now, I want to know whether that was really a felony.

Mr. Baldwin. It was a proper thing to do as a matter of fact, I think, but it is not a proper thing to settle a criminal prosecution, great or small, in the eye of the *law*.

Mr. Perkins. Suppose that I own, with another person, a bank of earth which is used for filling, which has an elevation of some twenty feet above the surrounding elevation. If the gentleman who owns the other half wants to use it for purposes of filling, how can he approach me?

Mr. Baldwin. The principle is this: that you cannot dig so near the dividing line as to cause any of his dirt to fall into the pit, without paying him damages; but if you choose to drive down boards at the dividing line, so as to shore up his earth, then you can dig clear up to the line. But if his dirt falls down, you must go and throw it back again on his side.

Mr. Perkins. Will that include wash by rains which might wash thirty feet at the base?

Mr. Baldwin. It would, I think. If it washes down by rain afterwards, in consequence of your digging, the dirt washed down is his, and you have done him a legal damage, if you use it for your own purposes.

Question. I have one question to ask in regard to turnpikes. If a turnpike is discontinued, either by the company surrendering their charter or throwing open their gates in such a way as must invite travel, does a town, by making repairs upon the road, assume it?

Mr. **Baldwin**. I do not think a single act of repairing would be sufficient; but if it was continued for a long period of years, a jury would probably assume that the town had accepted the road, and that the company had ceased to exist.

Question. Does it become a town road simply because the company have discontinued their gates?

Mr. **Baldwin**. No, sir, it does not.

Mr. **Sedgwick**. In case a private road becomes public by use, can a town compel you to widen it beyond the original boundaries, without compensation?

Mr. **Baldwin**. No, sir; not at all. If a man dedicates to the public a strip of land twenty feet wide, he cannot be compelled to dedicate a strip forty feet wide.

Question. Under what circumstances, if any, can an adjoining proprietor take up his division fence and throw his lands out to common?

Mr. **Baldwin**. Of course, every man is bound by statute to keep up his share of a division fence. If he takes it down, the adjoining owner can go to the selectmen, as fence-viewers, and have it restored. If the man who took it down will not rebuild it, the other can rebuild it, and recover expenses.

Question. Can a man under any circumstances take down a division fence so as to throw his neighbor's land out to common?

Mr. **Baldwin**. No, sir; not without being liable for damages, if any happen in consequence.

Question. If the public drive across an open common until they form a road which is used for years, is the town obliged to repair that road, and is it liable for damages upon it?

Mr. **Baldwin**. I suppose a town, or the proprietors of its common lands, can dedicate a road, like an individual. If such a road has been established by dedication, has been accepted by a sufficient user by the public, it becomes a public highway, if this continues for a sufficient length of time for a jury to find that there is a road there.

Question. And the town can be made to repair it?

Mr. **Baldwin.** I think so.

Mr. **Sedgwick.** In what way must I apply to the selectmen to get a private way to my land, where the public road has been discontinued?

Mr. **Baldwin.** It is laid down in the statutes. There is no particular formality. You apply to the selectmen and state what you want.

Mr. **Sedgwick.** And they are compelled to give me a right of way?

Mr. **Baldwin.** Oh, no; not unless they see fit. But you have a right to appeal to the Superior Court, I believe, if they refuse.

Mr. **Perkins.** If I want to abandon a tract of land, (of course I cannot own a tract of land without adjoining something,) is there any law whereby, by petitioning the selectmen, I can throw that land into common?

Mr. **Baldwin.** I do not recollect such a statute; but, as I said a few moments ago, I never feel competent to answer a question upon statute law unless I have the book before me, although I have had occasion to look over the statutes as much as most lawyers. One of the greatest lawyers that ever lived once said that if he were asked a question concerning the common law, the unwritten law, he should be ashamed if he could not answer it, without looking in a book; but if he were asked a question as to the statute law, he should be ashamed if he could answer it, without looking at the book; and I feel very much so.

Question. I would like to inquire if a man who is at work repairing a road for a town, has the right to take the soil in front of A's land and put it on the highway in front of B's land?

Mr. **Baldwin.** He has the right to do it, provided it is not unreasonable. That is the question. If it is a reasonable use of the earth, he has a right to take it from one man's land and put it on another's. We had one very strong case of that kind in New Haven. A man owned a large bank of earth within the limits of a new highway, which he wanted to use for his own purposes. The city was laying out another new street not connected with the first one, and they wanted to cart this earth off and use it to grade the second street. He began to use the dirt himself, and the court granted an injunction to prevent it, at the application of the city. The court said the city had a better right to the dirt, than the owner of the land.

QUESTION. Can they cart earth from one street to a cross street?

Mr. BALDWIN. I think they could, if they acted fairly,—reasonably.

Mr. GILLETTE. I understood the lecturer to say that in the case of a division fence, the line between the proprietors is run between the posts and the boards; is that so?

Mr. BALDWIN. Yes, sir; if it is a post and board fence.

Mr. GILLETTE. In the case of a common post and rail fence, I would inquire where the line would run?

Mr. BALDWIN. Through the center of the posts.

Mr. GILLETTE. Then it varies according to the fence which is built?

Mr. BALDWIN. Yes, sir.

Mr. GILLETTE. The common assertion, I think, is, that in all cases, the division line should run in the middle of the fence.

Mr. BALDWIN. That is the case with a stone fence, with a ditch, or with the one you suggest; but not, as I understand it, with a post and board fence.

Mr. GILLETTE. Why should there be that distinction?

Mr. BALDWIN. It is unwritten law, which has grown up by common consent.

QUESTION. Can a man dig the post holes on his neighbor's side?

Mr. BALDWIN. Yes, sir, if he chooses to put the boards on his side.

Mr. GOLD. Supposing a deed contains this provision; that the grantee is to maintain a fence forever. On whose land is the fence to run, then? Does that clause in the deed affect the location of the fence?

Mr. BALDWIN. I think it would be half and half as before. The meaning would be there, that the expense should be borne by the grantee.

Mr. GOLD. You say "half and half." Supposing we build a stone fence six or eight feet wide, have we a right to put one half of that on our neighbor?

Mr. BALDWIN. I should say not. As I recollect the statute, it is express with regard to a stone-wall; I am quite sure it is three feet. If you want to build a wall six feet wide, you must put 4½ on your side and 1½ on his.

Mr. GOLD. Supposing some stones from a wall fall upon a child, or upon a person who climbs over into the field as a trespasser, is the farmer responsible for the falling down of those stones upon the trespasser?

Mr. BALDWIN. The hardship to which you allude was pressed very urgently, in the case to which I referred, where the boy shook the gate and it fell down upon him, and it was left to the jury to say whether the man who built the fence was negligent in not having a sufficient one, whereby the child was injured. In the case you put to me, the question put to the jury would be, whether the man who owned the wall was or was not negligent in leaving it in such condition that, if a man shook it, it would fall down. There would be another question, too, whether the person injured did not contribute to his own injury. If he was in fault, too, he could not recover. The boy was thought too young to be charged with any fault.

Mr. GOLD. If a pond is drained, who is to have the land when it is drained?

Mr. BALDWIN. Whoever owned the bed before it was drained.

Mr. GOLD. Well, who owns the beds of our natural ponds?

Mr. BALDWIN. The law is, if you deed on a natural pond, it only goes to low water mark; but the common way is to deed to the center of a natural pond; then, of course, the pond goes with the upland. But sometimes the beds of our ponds are reserved entirely for ice ponds, and the deed bounds to the line of the pond, and then the bed is sold separately to somebody else.

Mr. WELLS. Have we the right to change the flow of surface water from one direction to another for the improvement of a certain lot of land?

Mr. BALDWIN. If the surface drainage has formed a distinct stream, that could be seen, and it has been accustomed to flow over your neighbor's land, and he has been accustomed to use it beneficially, you cannot do it to such an extent as will essentially injure his right to continue that use. You can divert it on to your own land where you please, but it must enter his land where it has been accustomed to enter it, subject to such reasonable use as you think necessary.

Mr. AVERY. Here is a living spring which has had its outflow at a certain place for a century, perhaps. Has the adjoining proprietor a right to dig a well by the side of that spring so deep as to injure it essentially, and thus injure his neighbor?

Mr. BALDWIN. The general principle is, that the law does not look after subterranean currents; it is enough for the law to look after currents that can be seen. If there is a subterranean current between that spring and somebody's field, ten rods off, and he digs a well there, whereby that spring is drained, he is not liable. The reason of the rule is, it is very hard to tell whether there was any current between the spring and the well that is dug. The law cannot look through the dirt.

Mr. AVERY. Well, the consequences might be very visible. You might dig so deep near the spring that there would be no spring at all.

Mr. BALDWIN. I know it; but the general rule would be that he could do it, unless he did it maliciously.

Mr. AVERY. You might not call it malicious, but the natural consequence would be, if he dug deep enough, to virtually annihilate that spring.

Mr. Baldwin. He would have a right to do it, if he did it for beneficial purposes, it being a case of subterranean drainage. You see there is no visible current of water between the well and the old spring; it flows under ground, and the law does not look through the ground.

Mr. N. Hart. I draw my water supply from a well on my neighbor's land. I have no writing giving me the right to do it. How long must I take that water in order to acquire a right to it?

Mr. Baldwin. You are taking it by his leave, are you?

Mr. Hart. Yes, sir.

Mr. Baldwin. Then you are acquiring no right at all. You are not putting yourself in a position adverse to him; you are simply borrowing his water.

Mr. Hart. Let me put it in another light. Supposing I have been taking it for a term of years for a part of my own farm, or supposing my predecessor, owning the whole of the land, sells the part of the farm from which my water comes, to another individual, and then I obtain my right to the part of the farm which I occupy, and still continue to draw this water, without having any acknowledgment in the deed from the other party, how long must I draw that water in order to have the right to take it?

Mr. Baldwin. The original proprietor, who owned the whole of the land, of course acquiring no right against himself, whatever rights you acquire, must be acquired after he parted with possession. If you continued to use the water, based on a claim of right, continually for fifteen years, the other party knowing it and acquiescing, not giving you any leave or license, then you acquire a right. But I think a jury would be very apt to presume, in the case you put, that you were doing it with leave and license, not adversely, and in that case there would be no right acquired.

Mr. Wells. If I sell a piece of land across which a water-pipe has been laid to supply water from one part of a farm to another, have I any right to go on that piece of land, after having sold it, to repair that water-pipe?

Mr. Baldwin. You sold the pipe with your land, unless you made an exception in the deed, and it no longer belongs to you, and the purchaser can cut it off, if he wants to do so.

Mr. Augur. Supposing a gentleman—or supposing a man, I won't call him a "gentleman"—send a keeper with a herd of cattle, who allows them to graze on a lawn in front of another man's house, is there any redress for that?

Mr. Baldwin. Impounding them.

Mr. Augur. Any other?

Mr. Baldwin. If the keeper turns them on the lawn, he can be sued for it.

Mr. Webb. The statute law prohibits cattle running loose upon the highway, with or without a keeper, and they are liable to be impounded.

Mr. S. L. Hart. If the adjoining proprietor owns the highway, to all intents and purposes, just as much as he does his adjoining land, why has he not the same claim upon cattle that destroy anything on the highway as if they came on his farm?

Mr. Baldwin. Because you run against this statute about fences, and because cattle can't be driven along the highway without doing some damage, or the liability to do some.

Mr. T. L. Hart. Then are we to understand that the statute law requires us to keep a front fence?

Mr. Baldwin. I so understand it, substantially.

Mr. N. Hart. In those mountainous regions, where we cut off our wood perhaps once in twenty-five years, the adjoining proprietors own the land all around, and when we go there once in twenty-five years to cut the wood, do we go across the adjoining proprietor's land under the law of necessity, or do we go under a right that we have acquired and kept up, having done so once in twenty-five years?

Mr. Baldwin. That depends in part upon how you got your interest. If the mountain wood-land was originally owned by the same parties that owned the land between that and the highway, and was sold by them to third parties who now own it, or their successors, then you have got all the way you want, as a way of necessity.

Mr. **Gold**. But those pieces are not ordinarily so held. They were matters of separate sale and purchase, and were not bought of the owners of the intervening land across which they are obliged to pass.

Mr. **Baldwin**. I think, on the contrary, it will be found that in most cases, those wood lands some distance from the highway, have been sold by parties who owned some land on the highway.

Mr. **Gold**. In some cases, the mountain lands lie a mile or more from the highway, and it is not probable that one proprietor owned all the intervening land.

Mr. **Baldwin**. In such cases, there might be an adverse right acquired, if your user was long enough.

Mr. **Stillman**, of Norfolk. I think I know something about this law restraining cattle from running upon the highway. I have been of the opinion, from what I have been able to gather from the gentlemen (I may not apprehend the whole matter, as I have not been able to hear very well where I have been located,) that persons have a right to turn cattle upon the highway, and that those who own land adjoining highways must keep up a legal fence, that will prevent their entering upon their land; and if the fence is not a legal one, and the cattle enter upon their land, they cannot collect damages.

Mr. **Baldwin**. They can carry them to the pound, and claim their lien on them for damages under the statute.

Mr. **Stillman**. As I understand the law now, it says expressly, that cattle shall not run at large upon the public highway, to begin with. In the second place, when a highway is made through a section of country, they simply take the right of way; they cannot have the fee simple of the land. Then the town has the right to go on and lay out the way, and they are to work it in such a way as that vehicles may pass through; they may work it as well as they please; but when this is done, the question arises, as I understand, whether the adjoining proprietors shall support fences that shall keep cattle from entering upon their land. I have claimed not, and for this reason. Is a man owning land upon the highway obliged to spend from seventy-five to a hundred or a hundred and fifty dollars a year, as the case may be, in order to put his land in a state of security, that his neighbors who are disposed to let their cattle run at large, may run cattle upon this land adjoining him, of which he has not sold the fee simple? They have simply taken the right of way from him; nothing more. He has a right to mow the grass upon the land within the fences just as much as he ever had, as I understand it, and he may take the cattle, which are considered as trespassing, into his own yard or lot, or into his own custody, and may retain them until the owner pays twenty-five cents for each cow or ox, and fifty cents, I think, for a horse. I drew the bill with my own hand, and went to the legislature and presented it to the committee; they took the matter into consideration, and the bill passed; thus giving a man the right to take cattle that were trespassing upon him into his own custody, and he can retain them until the damages are paid, and the twenty-five cents poundage.

Now, in regard to this question of fencing. It has been claimed that a man is under no obligation to fence his own land on the highway, in order that others may have the privilege of using it as a public pasture. I think it is contrary to all reason that such a thing as that should be held up at all.

QUESTION. Is it necessary for a man to give notice that he has these cattle?

Mr. STILLMAN. It is necessary that he should give notice to the owner of the cattle immediately, if known. He should give notice as soon as practicable, the idea is; and if the owner refuses to come for the cattle, after retaining those cattle for a certain length of time, he must give notice to the town clerk that he has those cattle in his possession, and the clerk puts up a notice that he has those cattle for sale, and, under certain circumstances, which the statute sets forth, they can be sold.

Mr. T. L. HART. I have understood this matter just as the gentleman last up does,—that the public are under no obligation whatever to build a front fence. Owning the adjoining highway, if cattle get into his grounds, a man can take them, and collect damages. I have acted upon that supposition. We leave our gates open, and if cattle get in we expect damages.

Mr. N. HART. I think that in the assessment of damages in laying out a road, the expense of building fences is always included.

Mr. T. L. HART. That does not compel the proprietor to build fences.

Mr. N. HART. Certainly it does. He is paid for doing it in the assessment of damages.

Mr. WELLS. Suppose they do not get damages, but have to pay benefits,—who then pays for building the fence?

QUESTION. Suppose a turnpike company abandons a road over which there is a great deal of travel, and it becomes dangerous and impassable, if the town is not obliged to repair it, what remedy have the public?

Mr. BALDWIN. There are statutory remedies in regard to this, by the action of the County Commissioners; and the town itself, by agreement, may assume the burden of the road, by vote of the town, if I recollect rightly. There are several statutory provisions on the subject, which are considered ample.

QUESTION. In regard to holding land by possession, supposing a man erects a building upon my land by permission, could he then hold it by possession after the lapse of fifteen years?

Mr. BALDWIN. He could not, unless afterwards the relation were changed, and he held under a claim of right. Otherwise, it would be mere leave and license. It would be your building, if it was one of a permanent sort, and he would have a right to occupy it only as long as you chose to let him.

QUESTION. If, at the time the building was put there, he paid me a nominal rent, say ten or fifteen cents a year, because I did not wish him to acquire a right by possession, and after a time he failed to pay the rent, and I failed to collect it, would that make any difference?

Mr. **Baldwin.** Yes, sir, I think that would be a circumstance from which the jury might infer that he had been holding adversely to you after the time when he failed to pay the rent.

Mr. **Augur.** In regard to turnpike roads, I would like to ask one further question: Supposing the turnpike commissioners give notice to a turnpike company that certain repairs must be made, and they neglect to make those repairs for a certain number of days, and the commissioners then notify the town clerk in each town that the turnpike company have neglected to make the necessary repairs, do not the towns having such notice become obligated to take the several portions of the turnpike within their respective limits, and put them in repair?

Mr. **Baldwin.** If I recollect right, the statute provides, that in the case you suggest, the road shall become and remain a public town road. If so, the town would be obliged to maintain and repair it.

Mr. **Hubbard.** I should like to ask one question: Where farms are bounded by a small stream, the boundary, as I understand, would be the center of the stream, and where earth is brought down and deposited against one bank, it would belong to the proprietor on that side. Does that involve a shifting of the boundary, as the stream may shift by accretion on one side and washing away on the other?

Mr. **Baldwin.** I am not certain on that point, but my impression is that it would change. Of course, where a stream deserts its bed entirely, and makes another circuit, it would be different. There the old boundary would remain; but where the bank on one side of a stream increases by slow accretion; this increase goes with the bank, and so adds to the extent of the land of whoever owns the bank, and I think as the center of the stream would be carried further from his land in this way, his bounds would be extended in the same way.

Adjourned to two o'clock.

AFTERNOON SESSION.

The Board re-assembled at two o'clock, Vice-President **Hyde** in the chair.

THE WATER SUPPLY AND DRAINAGE OF FARM HOUSES AND BUILDINGS, IN THEIR SANITARY RELATIONS.

By Prof. W. H. Brewer.

A sickly farmer with a sickly family is in a miserable plight indeed. I need not dilate on this to an audience of farmers. Now, his own health, that of his family and employees, of his live stock, and even of his customers is intimately related to the water used in his home. In this lecture I refer to water for drinking and for household uses. Considered in their sanitary relations the same questions are involved in the water supply and the drainage of the place, and they will here be so treated.

In former times, sickness was usually considered a mysterious affliction, its origin beyond our control, and the work of the doctor was entirely directed to its cure. Modern science is rapidly changing this, year by year throwing fresh light on the causes of disease and furnishing means for its prevention, or it may be better modes of treatment. And where not showing the *causes*, it has often fully determined the conditions which favor it. Sometimes we have found both the cause and the preventive or cure, for example, with *Trichinosis* or the pork-worm disease, where we know the cause and the *preventive*—or the *itch*, where we know the cause and the *cure*. In other diseases we have found the cause but not the cure. In a great class of diseases, whether or not the immediate *cause* has been explained, we know well the conditions which favor their spread and increase their malignancy. As a result of all this the *prevention* of disease is attracting more and more attention every year,—hence boards of health, and sanitary associations, and new laws relating to the public health.

If a man's sickness only affected himself, it would be of less importance. A man may take a cold and lose his labor because of leaky boots, but his sickness interferes only with himself or his family, hence it is no business of his neighbors, unless he be a pauper and they have to support him. There is no need for the law to interfere and compel him to have his boots mended, and if he refuse, to have it done by the public officer and compel him to pay for it, or if he be too poor, to have the repairs paid for out of the public treasury. Not so however with a vast class of diseases. When a man has small-pox or typhus or typhoid or scarlet fever, his sickness then *is* the business of his neighbors.

There is a vast class of diseases which has specially afflicted mankind in nearly all ages. They are called by the general name of *Zymotic* diseases, some of these are very contagious, like small-pox, others (of which cholera is a notable example,) without being actually contagious in the popular sense, yet spread in great epidemics by a peculiar kind of infection. The Plague and Black-death of the middle ages were other examples. Still others, like typhoid and diphtheria, while never assuming the features of such great epidemics as the preceding, are perhaps even more terrible because they are ever at work, picking out their victims here and there, wherever they find the right surroundings, each year sweeping away a vast number of human lives. Diseases of this class have this common feature, that *they flourish when the surrounding conditions are right.* For their existence they do not depend on our previous health or constitution. If the *surroundings* are favorable, neither previous health, nor age, nor sex, nor social position, nor strength, nor weakness, protect us. A strong constitution may resist the ravages of the disease after it has set in better than a weak one, but many of them attack strong and weak alike, and some of them, like typhoid fever, are more apt to prove fatal to persons in youth or vigorous manhood than to the aged.

The absolute *cause* of these diseases is still an unsolved problem. With such as the small pox, the infective principle or "germs" is known to be in very small particles, so very small as to be seen only with a good microscope. When these are introduced into the blood of a person who has not already had the disease, they remain there a certain length of time before the disease appears, precisely as a seed requires time to sprout, or an egg to hatch, then the disease appears, and fresh particles in immense numbers are produced which in turn may infect new individuals, and thus the disease spreads. With diseases of this special type, it is believed that they do not start anew except as they are derived from some previous host. With cholera, typhoid fever, &c., the germs are not known to a certainty. This much we do know, however, that the dejections of persons sick with these two diseases will infect others when introduced into the stomach. *Of this there is no question*, and so far at least, the diseases are contagious, and this way they are certainly, and perhaps usually, sometimes spread.

Regarding the absolute character of the *virus* in either case, there are two opposite theories. The first is that each of these diseases is caused by a definite, specific living organism, which, in the system of its victim, multiplies and grows at the expense of the host, changing the chemical character of the blood or fluids in which it lives, precisely as yeast-cells, (which are living cells, too small to be seen by the naked eye, yet well known under our microscopes,) change solutions of sugar or other fermentable substances, multiplying and growing in the medium which they change. These are killed by boiling, or by steam, just as some disease-germs are. Many kinds of chemical changes are known to be produced by such living beings, or "ferments." It is also known that *some* diseases in man are thus produced, it is also thoroughly proved that many plant diseases and "rots" and "blights," are so produced. One theory infers from these and other facts, that the diseases of which I am speaking are to be explained the same way. It is because of the similarity of this class of diseases to the phenomena of *ferments* that the name "*Zymotic*" has been applied.

The other and opposite theory is, that the infectious particles which produce the disease are *not living germs* which produce new living organisms to prey upon their new host, but are *dead matter*, which, introduced into the living man, kills the living particles there, thus producing more dead matter, without the intervention of new active living forces. The chemists and botanists, I think, incline to the first theory, the physiologists perhaps incline to the second.

Although the two theories are so opposed in principle, the practical treatment of these diseases is the same under both, and this is especially important to us, because, usually where the doctors disagree the patient suffers. In this case they agree as to the practical condition, and practical treatment, they only disagree as to the invisible way in which the work goes on in the victim.

With such diseases as the typhoid, one class of theorists claim that when certain *dead* matter produces the conditions of disease, the disease then starts, precisely as some people believe that in a rich but neglected field weeds may start up spontaneously; others believe that the disease like the weeds, must have the living seeds, that if the field is neglected weeds will come from seeds that are lurking in the soil. Both agree however, that with care the weeds may be kept out, and that if once in, they agree as to how they spread from seeding. Precisely similar in the case of these diseases, whatever may be the true theory as to their exact cause, all theorists agree as to the conditions most favorable for their starting. And when once started, *we know how they may spread;* that is no longer a question. Moreover, the advocates of both theories agree as to the means of prevention, and also as to most of the practical questions relating to their management. They also agree in calling them *preventable diseases.* I dare say that many of you have heard this phrase used often enough before, and may think that the term *preventable* is too strong. When we say that such diseases are *preventable*, we do not mean to say they will ever entirely cease. We mean that their causes (or conditions) are so largely controlable that if they do not cease, it will be because *all* of the controlable conditions of health will never be entirely complied with by the careless, heedless, and the ignorant. These diseases are preventable in the same sense that steam-boiler explosions are preventable. Deaths by such explosions are fewer to-day than they were forty years ago, simply because travelers demand that the boilers have more intelligent care bestowed on their use, and when people learn to be as much afraid of an unclean well or neglected drain as they are of a weak boiler or a careless engineer, then deaths by typhoid fever and similar preventable diseases will be of rare occurrence.

Large towns and cities are usually supplied with water for household uses from rivers, but the vast majority of our farmers depend upon springs or wells. Pardon me if I state a few elementary facts before passing on to the application. The water which falls from the clouds in rain or snow is essentially pure, containing dissolved in it only certain gases from the air. It sinks into the soil, and seeks the lowest level. That which falls on the hills gathers in underground streams and finds its way to the surface at lower levels in springs. A deep hole tapping these underground water-courses is a well. Spring-water and well-water are essentially alike in character. In both cases, the water while passing through the soil or rocks has dissolved some of the substances it has met with on its way. The books often speak of these dissolved substances as "impurities." I think this use of the word, (it was introduced by the chemists) is unfortunate for the reason that in a *sanitary* point of view such waters are usually pure, and they may be even healthier for use than chemically pure water. In this lecture, therefore, I apply the term *impurity* to such substances only as injure water for drinking or household uses. Water is one of the most universal solvents known. It will dissolve in small quantities nearly all of the mineral substances commonly met with, and also a great variety of organic substances. By *organic*, I mean substances which once formed part of animals or plants, and which are capable of decay in contact with air and moisture. Some of them decay quietly and without smell, others undergo putrefaction and stink. Water containing any considerable quantity of decaying organic matter, animal or vegetable, whether it stink or not, has always been regarded as unhealthy to drink. Often, however, such matters are made less unwholesome by boiling; of the efficacy of *boiling*, in multitudes of cases, there is abundant proof.

Again, it is well known that soils possess a certain cleansing property, and that dirty water is purified by passing through it. This is a matter of common observation, all works on agricultural chemistry treat of it. The disgusting liquor that drains from farm-yards, water from sewers of cities, stinking liquids of various kinds, even putrid urine percolating through soil becomes limpid and pure. The demonstration of this fact is a common laboratory experiment, but it is also found that the soil by continued use soon loses this property. It becomes saturated with the filth, and when once saturated, it takes a long time and rest and oxidation to regain the property. Now, this last fact I wish to impress upon you. Every one remembers that soils cleanse putrid waters, many do not know that this does not go on indefinitely, and that the cleansing power may practically cease. This is one great reason why cities and towns become unhealthy with age unless special precautions are taken. I was once a student with Liebig, in Munich, an old Bavarian city, situated 2,000 feet above the sea, on a very thick bed of limestone gravel. The city had then over 100,000 inhabitants, was compactly built, and was without either sewers or water works. Water was supplied by wells sunk into this gravelly soil; into this same gravel the filth of the city had been sinking for eight centuries, for when Columbus was born that city was already much older than any city we have yet. Need I describe that well-water to you? By the very mention of the conditions I see some of you lift your noses as if you already smelled it. No wonder that to some persons it was almost deadly. Beer was the common drink of the people from the peasant to the king. One of my teachers there, a revered professor, when he remonstrated with me on the danger of the experiment I was trying of drinking the water, told me that *he* had not tasted it for fourteen years except to clean his teeth.

Of all impurities in water, human excrement is the most unwholesome, yet one very often found in it because of soils becoming saturated from privies or cess-pools. This is perhaps the leading cause of waters so often becoming unwholesome in crowded cities.

Now let me cite some noted cases of epidemic disease where we know the sources, and how they spread. Certain trials were held in Oxford, in England, in 1577, still remembered for nearly three centuries, as the "*Black Assizes.*" Some poor wretches were brought into the court room for trial. They came from their filthy prison, sick with "jail fever," a form of typhus, produced by filth, neglect, and bad air. Baker tells us in his "Chronicles," that *all who were in the court room died in a few days*, judge, jury, sheriff, council, and spectators, not one in the room escaped. One authority says that 300 persons died within forty-eight hours. This illustrates that such a disease, although originating in the crowded, filthy prison, when once started, swept all who were exposed; cleanly and filthy met the same fate. The pestilence, like a tiger, once unchained, takes whomsoever it finds in its way.

Typhoid fever increases in frequency as a country becomes older, unless special care is taken, and is especially dreaded in many farm-houses. A great majority of those who have investigated this disease believe that it often originates directly from, or as the consequence of filth decaying out of sight, in dark places, away from sunlight.

Let us cite two epidemics of typhoid fever in counties adjoining this, both in regions believed to be particularly healthy, and where the facts and conditions were pretty fully investigated.

The first was the outbreak at Maplewood, in the county north of this, in July and August, 1864. A committee consisting of three eminent doctors, professors in three medical colleges, made an investigation and published a long report in the Boston "Medical and Surgical Journal," in 1865. The epidemic was in a young ladies boarding school. There were seventy-seven resident pupils from various States, which with teachers, servants, &c., made a family of 112 persons. There were also a few day scholars from the village. A few were taken sick in July; then followed a terrible outbreak in August. Of seventy-four resident pupils sixty-six had sickness of some kind, (who answered enquiries;) fifty-one had typhoid fever; thirteen died; the others "more or less recovred." Of the whole family of 112, fifty-six had typhoid fever, and sixteen died. This was in a town famed for its beautiful surroundings, good water, fine climate, and generally healthy natural conditions. The committee traced the trouble to "the state of the privies, and the drainage of the place." The sixteen deaths carried desolation into nearly as many homes, and thirty-eight young ladies had their health more or less injured for life, and in the light of modern knowledge, there is now no question but that all this was a sacrifice to ignorance or carelessness by those who should have known better. I cite this case to illustrate the results of bad drainage about privies, and not to prove the original source of the disease.

Lake Mahopac is a beautiful little sheet of water in the county west of this, in the Croton basin, about fifty miles north from New York, and about 500 feet above the sea. The purity of the water and air, the natural beauty of the place, and the ease of access from New York make it a justly popular place of summer resort. The "Gregory House," for city boarders, was especially so. It was owned by a Mr. Gregory; was supplied with water from the lake, which ran through earthen pipes, to a brick reservoir, and then was forced to the higher parts of the house by a hydraulic ram. The popular house was enlarged, a small steam engine put in to do the pumping, and another reservoir was built under the house to supply this engine, the new reservoir connecting with the old one; so far all went well, and then a "Land Improvement Company" took the house and "improved" its accommodations. A steam laundry and larger engine were put in, and the smaller one and its reservoir fell into disuse, but its connections with the first remained. The next summer, 1871, there were some cases of typhoid fever, and at various times diarrhœa and vomiting prevailed among the servants and guests. The proprietor found that the trouble arose from impure water, in the disused reservoir, mingling with and contaminating the drinking water in the other cistern, with which it was connected. The reservoir was cleaned, and the trouble ceased. During the next year, 1872, especial care was taken to keep the reservoir clean, and there was no special sickness. In 1873, diarrhœa and other sickness set in; it was found that the reservoir had been neglected, but when proper attention was paid to it, the sickness ceased. The proprietorship again changed; a stranger to the place, who did not know the previous history, became landlord, and the next year, 1874, the house was opened late in June. The season began well, as landlords say; in two weeks the house was well filled, some 500 people there, guests and employees. On Monday night, June 29th, a number of the guests were affected simultaneously with a disturbance of the bowels. A change of weather took place at the same time. Such an attack in a farmer's family would be called "summer complaint," caused by the sudden change from cool to very hot weather. There was purging, vomiting, and prostration. To cut a long and sad story short, typhoid fever set in, and five persons died. The case was investigated; it was found that some of the kitchen slops accidentally drained into the disused and neglected cistern, under the kitchen floor; that it was dirty; that under certain conditions the water set back and polluted the drinking water in the first cistern, with which it still remained connected. This landlord, when he found the trouble, cut the connections, cleaned out the useless reservoir, filled it up with fresh dirt; since then no more typhoid fever, and this year the place has been as healthy as ever. In "*The Sanitarian*" for the last two years, you will find various articles showing how fully the case was studied, how complete the proof, how speedy and how effectual the remedy. Now, this kind of contamination is so common about farmer's houses that I will review this case. The house was healthy; it had a reservoir for pure water, when a new cistern connected with this was built under the kitchen to supply an engine; both engine and new cistern fell into disuse; slops from the kitchen soak into this cistern, and in 1871 there is typhoid fever; the cistern is cleaned out, and the sickness ceased. In 1872 it is kept clean, and there is no sickness. In 1873 the cistern is neglected, sickness sets in again, the cistern is again found dirty, is again cleaned, and again health reigns. Then comes another landlord who knows nothing about this death-trap so carefully set and baited under his house. He opens his house, and in less than two weeks, the old trouble comes on worse than ever. Again the cause is found; he tears out the cistern, source of all the trouble, cuts off the pipes, cleanses the spot and fills it with fresh dirt, and since that time it has been as healthy as ever. And what is the cause of all this sickness and death? Impure water. What polluted it? Kitchen slops; *of this there is no question.* Now let us notice that *all* who were exposed did not become sick. In 1874 it is believed that 800 or 1,000 persons were exposed during the outbreak. Out of these about one hundred were seriously affected; say only one in eight. Of the one hundred who were sick about twenty-five had fever; that is, about one in thirty of the exposed persons. Of the fever patients, fifteen had typhoid, one in fifty of the whole number; of the fifteen, five died.

Now, was death, or even sickness sure and speedy, as with a rattlesnake bite, mankind would long ago have learned to avoid all this. But it was not sure in the above case, only one in 160 or 200 actually died, and some years none at all, hence many men are slow to believe what the true source of danger is. There is an uncertainty, and this uncertainty is construed into a want of proof. A place escapes for years, then suddenly some new condition arises or the old condition becomes suddenly worse, becomes fatal, and people are slow to lay the blame where it actually belongs. In their carelessness they neglect to do what they think, perhaps, had better be done, and yet which they do not think is imperative. The trap does not spring every time, so they make themselves believe it is not set. The actual dangers that existed at that school, and at that hotel, were precisely similar to what exist in or about hundreds of farmers homes in this State. Carelessness about the privy, carelessness about the kitchen slops, there is no trouble for some years, then sudden and mysterious sickness, the patient may recover, but with weakened constitution, or a loved one may be followed to the cemetery.

Sanitary writers of late years have had much to say about the *gases* of decaying filth, producing typhoid fever. Many believe such *gases* are often the *source* of that disease, particularly where the filth decays in the dark. Others deny this, and hold that *gases* will not generate it anew, from the filth itself. But *all agree* that after typhoid fever has once set in, that then the dejections of the patient are poisonous, as is also the case in cholera, and that it may, and very often does affect drinking water.

Without discussing the original origin of this or other diseases, let me give you some more examples of undoubted water poisoning.

There are some cases of cholera in London, nearly every year, and from time to time heavier outbreaks. Thus, in 1849, there was an outbreak when 14,125 died of cholera, and 3,463 of diarrhœa. In 1854, another, when 10,708 died of cholera, and 3,235 of diarrhœa. In 1866, another, when the cholera deaths amounted to about 6,000, and the diarrhœa deaths to 3,200 more. In every one of these "outbreaks," it has been demonstrated that the disease, after being once introduced, *was spread through the drinking water.* The whole demonstration of this would take entirely too much time to discuss here; suffice it to say, that there were long and full official investigations, and there are full reports, and on these were based legislation. I have brought with me some of these "reports" parliamentary "blue books," with maps, showing the distribution of water, deaths, &c., that such of you as wish to see the character of these proofs, can see in what shape it exists. I can only give the main facts without descending to the details, although often the details are more curious and interesting, and even convincing than some of the greater features.

Among the many water-companies supplying London with water, at the time of the epidemic, in 1849, were the Lambeth, pumping its water from the Thames, and the Southwark-Vauxhall on the same river, but farther up where there was less sewer pollution. A population of about 167,000 drank the water of the Lambeth company, of whom 1,915 died of cholera, or about 125 persons in 10,000. The Southwark-

Vauxhall company supplied 268,000 people, of whom 2,880 died of cholera, or about 118 per 10,000. Then the Lambeth company changed its source of supply and pumped its water from the river some miles farther up stream. When the next cholera outbreak came, in 1854, the Lambeth company supplied in round numbers, 25,000 houses, and 167,000 people, of which 611 died of cholera, or 37 per 10,000. The Southwark-Vauxhall company supplied 268,000 population, of which 3,476 died of cholera, or 130 in 10,000. In 1849, when the Lambeth company got its water lower down, where the sewage in it was greater than in the Southwark company's water, they lost more customers by cholera, and when, five years later, they had a better source of supply, the deaths of the other company were three and a half times as great, one diminished from 125 to 37 in 10,000, the other increased from 118 to 130 in 10,000. If we take the deaths by diarrhœa the same facts were shown.

After the outbreak of 1854, laws were passed compelling certain methods of purification to be used by these companies, and under this regime twelve years passed before there was another great outbreak. I have already alluded to that of 1866, when 5,915 persons died of this disease, and 3,200 more of diarrhœa. Out of 5,915, 4,276 belonged to what was known as the "East District." In this district there was no special condition of the soil, nor of exposure, nor of houses, nor habits of the people, yet the mortality by this dreaded disease, was more than seven times higher than in the rest of the city. On an investigation by the British government, it was found (on the confession of its engineer,) that one company had supplied that part of the city for a time, with water which had not been purified, as the law specially directed. The lives of 3,000 or 4,000 persons was the penalty for this crime.

There are certain features in each of these three epidemics specially interesting. First the slow start, then the sudden expansion of the epidemic, so sudden that the writers use the term "*explosion*" to describe it. And yet, in each case, it was *proved beyond a reasonable doubt*, that whatever may have been the original source of the disease, the "explosion" of infection was through the water. The two water-companies mentioned were rivals, both had their mains in the same streets, not one taking one side and the other the other, but each soliciting custom from house to house, often the customers of the two companies alternating in the same block, and as a result, infected houses sandwiched as it were, between the safer ones. In fact, the more fully one examines the voluminous records of the investigations, the more overwhelming seems the proofs as to how the disease was spread.

In the outbreak of 1854, there was one case of special interest. The story has passed into sanitary literature as the "Broad Street Pump" affair. Briefly told, it is this. A well with pump supplied a certain neighborhood. Its water was so clear and sparkling that it was particularly popular, and was considered exceptionally good. There was a case of cholera in the neighborhood, then a sudden outbreak of epidemic, and over 500 persons who used water from that well died. On a full and careful investigation it was found that the dejections of the early cholera patient had been thrown into a cess-pool near the well, and the underground track was found, along which water from this cess-pool percolated into the well, not enough of it to disturb the transparency of the water nor even its taste, but enough to infect those who used it, as shown by its hundreds of victims.

Why have I taken so much time telling how water is polluted *in great cities*, in boarding schools, and in great summer hotels, in a lecture to *farmers*, on their water supply?

I have had two definite objects in view. Firstly, I wanted to specially impress on you as forcibly as possible that the decaying filth of privies and sinks is often the source of active and dreaded diseases, or, at least, if not the ultimate source, it produces the conditions which favor such diseases and increases their malignancy. Secondly, that whatever may be the *source*, at first, that polluted drinking water is a common medium through which it is spread, it is usually the vehicle by which the disease becomes epidemic and affects others, than the original sufferer. The fact is, that epidemics in large cities, or at great hotels, or boarding schools, where a bad reputation for health brings financial ruin, are more carefully studied than the sickness found in isolated country homes.

For example: Typhoid fever breaks out in a farmer's family. It may be that some get well after a fashion, others die, and the country doctor who has attended the case rides on to visit the next patient. The suffering family mourns the affliction, moralize on the mysterious dispensation that carries off one in the vigor of youth or prime of manhood, and are slow to believe that the leaky drain or neglected stinking privy has been the real demon lurking about their beautiful home. Even if the source is suggested, perhaps the argument and the excuse is "the drain is no worse than it was last summer, and we had no sickness then." However that may be, there is no investigation, and the cause of the trouble is left a matter of doubt. In cities it is more apt to be investigated by Health Boards, or by some person officially interested. I hope to see the day when a fatal case of typhoid fever will be as surely the subject of legal investigation as a fatal railroad disaster, when a case of privy-poisoning will be a subject of inquiry to see who is to blame as surely as a case of arsenic-poisoning.

Pardon me for a personal explanation. For many years I have been specially interested in the questions relating to public health, and have been a diligent reader of sanitary literature, of the official reports of health boards, commissions, &c., both home and foreign. And looking through these thousands and thousands of pages it is sad to see how monotonous becomes the story of outbreaks and epidemics of *zymotic* diseases, and the same uniformity of *causes*, or at least of *conditions*. Bad water, bad drainage, foul privies, neglected garbage, are the usual accompaniments. If polluted water is specially noted, *oftener than otherwise this is from wells*. This is perhaps more true in Great Britain than in this country, because that is an older country, the population denser, the soil more saturated, and a larger proportion of very poor people living in unhealthy surroundings. In looking through the "Reports of the medical officer of the Privy Council," made yearly to

Parliament, the generalizations are so large, the cases so numerous that there is no longer any doubt at all as to the practical questions. In the very last one received, (and which I hold in my hand to read from,) I find in the tedious tabulated returns of "the circumstances in which *enteric fever* is commonly found prevalent," there is a list of 142 places which the reports cover, running over four years, 1870 to '73. I have examined them one by one, and find *bad water* one of the conditions named in 120 cases out of 142, or in six-sevenths of the epidemics. This is combined with other unsanitary conditions, and in nearly every case where bad water is not specially noted, bad drainage is.

In these tables, after naming the place, the ground of inquiry, the date of inquiry, and the authorities concerned, in the column headed "Inspector, and the chief facts reported by him," we find it runs in this way "*Dr. Home*—Enteric fever severely epidemic. Water polluted by excrement. No proper drainage. Nuisances from privies and pigsties." "*Dr. Harries.*—Serious prevalence of enteric fever. Polluted water. Nuisance from privies and refuse (garbage)." "*Dr. Hunter.*—Defective privy system. Pollution of drinking water," and so on through weary pages, only the most of the reports are fuller than I have given. The deaths are enumerated by the scores of thousands every year, (120,000 per year, officially stated.) Hence the efforts to bring the towns into better conditions, by better sewering, better water, enforcing more order about privies and garbage. In another report there is an interesting table, showing the decrease in fatal typhoid cases following changes in the sanitary conditions in the towns. This is no place for details, but the results are given in full, these tables constructed to show at a glance the results, as in the column, "Change in typhoid death-rate, per 10,000 annually," nine towns are enumerated where the changes run thus: "19 to 9, 10 to 4½, 12½ to 4, 7½ to 1¾, &c., a degree of change amounting to minus 52, to minus 75 per cent. Ten other towns show a degree of change from minus 33 per cent. to minus 48 per cent., others less, and in some the work was badly done, or there were other local causes, so that there was an increase instead of a decrease (9th An. Rep., page 44).

Let me say further, that for each case of typhoid fever, many cases of diarrhœa, and other bowel disturbances, occur. You remember, that in the Lake Mahopac case I cited, only five died, (these only would figure in mortuary tables,) but there were about a hundred cases of sickness.

If we read reports from the continent. it is the same story over again; from a German report, I will condense thus, as a typical case: Charity Convent in Munich, 31 out of the 120 inmates suddenly taken with typhoid fever, the well-water found to be polluted with the dejections of a typhoid patient—all this sickness ceased when this water was no longer used, and so on. Wherever our civilization prevails, we find this class of diseases accompanying the same sets of conditions.

I have cited more cases abroad than at home simply because the reports are made after more detailed investigation. But they are frequent enough here. How we hear every year of cases like this, a healthy little country town becomes a resort of city boarders. The house is enlarged, country hotels become crowded. At last typhoid fever breaks out. I have a long list,—here it is a sea-side resort,—there it is some pleasant country village, several have been girls' boarding schools,—but always the trouble is, *neglect*, neglected privies, neglected drains, or polluted water, are the usual accompaniments. Just so about farm houses, each of us can remember cases where this fever has invaded happy homes in localities usually healthy.

It is often a rather troublesome matter to get well rid of kitchen-slops. If we look about farm houses, sometimes we find a spout running through the back wall, with an ill-smelling puddle back of the house, with flies in abundance and a rank growth of weeds just on the margin. Sometimes there is a tub under it, and periodically the men of the family carry it out into the garden as manure. Sometimes it is conveyed farther away by an open gutter, or by a leaky wooden trough; but in most cases, it partly soaks in the ground beside the foundations or near the house, or partly evaporates, partly oxydises by the air. In particular conditions of the weather it may get into the well. If under ground, the soil pipes are often leaky, and the earth all around gets saturated. Under any of these conditions, such is the purifying action of air and soil, that *usually* there is no actual disease; but all at once, without previous notice, some decay, or ferment, or change, may occur, when disease-poison is generated; then comes fever, or diarrhœa, or dysentery, or some other one of these evils. Not uncommonly we see not even the conveniencies I have spoken of,—the housewife steps to the back door of the kitchen, gives the pan of dishwater a toss and flirt, and the water is scattered over the rank grass and weeds near the back door. Some of you smile as if you had seen your *neighbors* do that—not about your own home—well, it is not a *neat* way, but in a sanitary point of view is not so bad as the sunken barrel or stinking puddle under a spout. Where this filth decays under the full blaze of the sun, scattered in the free air, it is not nearly so unwholesome as where it decays out of sight and in the dark.

There are many ways in which slops may be got rid of, but none that I am familiar with that does not require *care and vigilance.* I have seen a large tub, a barrel sawn above the middle and set between permanent handles like a hand-barrow, which, when full, two men would carry to the garden. Sometimes a *tight* drain is the most convenient. What is the best way under each condition must be determined by the intelligent farmer. What I am trying to impress upon you is, that it is a matter that should not be neglected.

One phase of this question I have lightly touched on, not because not important, but because I have not the time. I mean, drainage of the *natural waters* from the soil, when they are too near the surface. The evils of damp cellars, of too damp soil around the house and barn, would take more than one lecture to adequately describe. So great are they, that one of the most learned sanitarians of the world rides that particular hobby. It is known that damp localities increase consumption. Before the American Medical Association, last year, the most overwhelming proofs were given of the relations between damp soils and certain diseases. A paper by Dr. Kedzie, on the drainage of land in Michigan and its relation to the public health, was especially suggestive. It is estimated that 20,000 miles of underdrains were cut in that state in the previous ten years, and the decrease in malarial diseases, particularly, had been very marked; some doctors stating that they prevailed only one-half or one-fourth as much as before the farmers had drained their land. Without following this out, I may say that troubles with well-water are much more apt to occur in sodden, wet soils, than in dry ones.

In the improvements in New York City, many old water courses were filled up and no drainage provided for. In time it showed itself terribly on the tables of mortality. Maps are made showing the relation between the deaths by certain diseases and these undrained regions. A drainage law was passed in 1871; above 45th Street and east of 5th Avenue, certain districts of the city were then drained, "and in two years, diseases of a typhoidal and malarial type, which had prevailed there for more than twenty-five years, almost disappeared."

Let us not forget that the evil of *death* is really not the greatest one. A man dead may be a loss to a family or a community, but he is not a burden. A *sick* man is no longer a producer, he is a burden, often a heavy one, on his friends. And a farm-house may have much sickness and yet little actual death. It is estimated that for each case of death, there are at least five cases of serious sickness. Now, all the causes I have named make sickness not only more frequent, but also more malignant. Where there is a damp cellar and unhealthy conditions about, sickness assumes a severer type. I picked up a paper this day telling of a peculiarly sad case of diphtheria in a certain town in this state; three members of the same family buried the same day, (only a few days ago,) and two more too sick to attend the funeral. Now, without knowing anything more of the case, it is very probable that there is something wrong about the drainage about that house; the malignancy of the cases there suggest that.*

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* After the lecture, a neighbor of that family stated to me that a year or two ago the spout of the kitchen sink was turned into a disused well under the house, which thus became a repository of kitchen slops, but that no harm had been noticed until this winter, "when the family has had considerable sickness."

Where cellars are damp, they must be *drained*. Putting cement on the walls or bottom is not enough. It acts like a dam against the water in the soil, but the dam is entirely too weak to be of any value. The inch or less of cement will not hold back the pressure of water.

We often find these unhealthy conditions about houses of beauty and taste. I have in mind a house on the outskirts of one of the prettiest and most quiet rural villages of New England. It is, perhaps, to the passing stranger the most striking house in the whole town. The soil is damp about it, great elms shade it, vines and creepers cluster over the porch and around the windows, moss clings in great patches to its old shingle roof, and pretty seats nestle in shady nooks about it. A large family of children were born in that house, but, one after another, dropped off, usually in early manhood or womanhood,—some of one disease, some of another; also the father and the mother. The only two children now alive went out in feeble health and became robust elsewhere. Some six or seven have died there since I have known the house, but little over twenty years. The damp soil, the dense shade, the moss on the roof, the dark vines shutting out light and air, beautiful though they all were, were among the evil spirits of the place. The well was shallow (although some of the others in the higher parts of the town are very deep), and the water had a poor reputation among the neighbors. That the home was unhealthy was shown by the fact that several children who were temporarily in other localities were in better health when away from home, yet returned there because of its quiet beauty and the culture of the home circle.

Now a few words on *good* waters for household purposes. *Hard* water is often spoken of as unhealthy. This is not so, as witness many districts west of New England. I mean waters hard from lime. Indeed, a region of hard water is often noted for its large men and fine stock, as Illinois and Kentucky. With some persons such waters do not agree very well; but as a whole, people drinking limestone waters are as healthy as those living on granite,—the men and cattle are usually larger. But such water is not so good for other household uses. It surely does not wash so well, and is not so good for cooking. *Magnesia* in the water injures it for drinking, but that is not an abundant ingredient anywhere in New England. The *clearness* of water is not a test of purity. The water from the "Broad Street Pump" was noted for its sparkling clearness, even when most deadly, for the actual germs of disease cannot be detected in waters by the best microscopes, as has been abundantly demonstrated. In some of the Western States water so turbid as to be disgusting to New Englanders is not necessarily unhealthy. Rain-water, if clean, that is, caught from clean roofs and kept in clean cisterns, is excellent for cooking, is healthy, but rather insipid to most persons. Sometimes, particularly in densely-wooded regions, as in some parts of the Adirondacks, water may be colored with vegetable matter, and yet be wholesome. It is *filth*, *decaying slops*, and worse than all else, *sewage*, that most often pollutes water about dwellings. This may be detected by careful chemical analysis, but not always by the microscope.

Regarding conductors, iron pipes are harmless; so, too, are usually wooden pipes; but if the water contains gypsum in solution, and the wooden pump gets a little rotten, then it decomposes the gypsum, and we get the stinking smell of sulphur.

A common source of danger is lead. When lead pipes are used, sometimes, but not always, a little of the lead gets into the water, and this acts as a cumulative poison in the system, slowly and surely undermining the health. This is believed to be one great cause of the increase of paralysis in cities, where lead pipes are so extensively used in houses.

I have purposely used most of my time in considering one phase of the important question assigned me. Regarding the health of the *live stock*, I shall have less to say. That bad water for stock is bad, all of you will allow. Our domestic animals lead a very artificial life, and, like civilized man, are subject to a great variety of diseases, many of which are caused or aggravated by bad water. It is probable that various parasitic diseases are spread among cattle by the water they drink.

Although I have taken up so much time already, I must use some more in speaking of the third consideration mentioned—the health of the farmers' customers. As this is a milk district, I will consider but one phase, one that has lately attracted some attention. Within the last few years attention has been called several times in New York State to the effect of bad water on the milk of cows. Fungi have been reported, disease suspected; but I am not aware that any careful investigation has shown that disease has been actually and unquestionably traced to it. We have suspicions and surmises in abundance, but no proof.

In the last "Reports of the Medical Officer of the Privy Council" to the British parliament, there are the detailed investigations relating to the spread of enteric fevers through milk in certain specific epidemics. These reports are quite lengthy, so I will condense them and give you the substance, and enough of the facts in detail to illustrate how carefully the cases were worked up. I will give three cases, which I think will be of special interest to Connecticut milk producers, particularly to those of this county.

The first is from the "Report by Dr. Ballard upon an outbreak of Enteric Fever at Armly, in the borough of Leeds." Two persons had typhoid fever; one of them died; the other, a dairyman, ultimately recovered. Four or five weeks later other cases occurred, which rapidly increased to an epidemic in July. After some time it came to be observed that every family attacked dealt with the dairyman who had been sick with the fever in May. Later the fever spread wider, and an inquiry showed that of 449 houses within the infected district 132 were supplied by the dairyman who had been ill, and of the 317 remaining houses in the district thirty-seven took no milk at all, three were doubtful, and the 277 families remaining distributed their custom among eighteen different milk-sellers. There were 107 cases of fever and about a dozen deaths. Of the houses supplied by the first man 37.8 per cent. were invaded by fever, while only 5.3 per cent. of families in the other houses were affected. "The manner in which the fever picked out customers of this dairyman in various rows and blocks of houses, sparing other families, was quite remarkable." (Examples are given.) Precisely how the milk was polluted is not known. It was believed that the milk was watered, but of this there is only circumstantial evidence. The report gives a plan of the dairy premises, but that throws no real light on this matter. This outbreak was in midsummer of 1872.

The next case took place in winter, at Morley, a suburb of Birmingham, and was a much more complicated affair. There were ninety-six cases of fever, and ten persons died. Up to the end of November, (1872,) there had been no unusual prevalence of this fever. Then it set in, and the first week of the outbreak, twenty families were stricken; the next week, eleven; the next, twelve; and so on until January 6, when fifty families had been invaded, and ninety-six persons attacked. Of the fifty families, thirty-one took milk of a dairyman we will call No. 1; four of another whom we will call No. 2; ten of No. 3, and two of No. 4; that is, forty-seven out of the fifty families. There were a large number of other milk-sellers in these same streets. A careful and full investigation showed the following facts. A boy who assisted milkman No. 1, had typhoid fever. This milkman produced a part of his milk; the rest he bought of farmers who delivered it at his house, and he distributed it from there. He supplied thirty-one infected families. Milkman No. 3, had but two cows of his own, not producing enough for his customers, so he bought of milkman No. 1, enough to make up the deficiency. He supplied ten of the infected families, and his son was attacked. Milkman No. 2, kept no cow, but bought milk of the farmers, and retailed it to his customers, from his house. He lived next door to milkman No. 1, and used a well in common with another family in the same block, and both wells, this one and that belonging to No. 1, were apparently polluted from the same source. Milkman No. 4, kept no cows, but bought his milk of No. 2, and retailed it to customers.

A careful examination of all the surroundings were made—I show you a map and plan of the premises. Chemical examination showed sewage pollution in both wells, and it is eminently probable that the dejections of the first patient, the boy help of milkman No. 1, caused the special pollution that infected forty-seven out of the fifty families. A touching episode in this tragedy showed that this poor boy was young in the trade; he had not sold milk so long as some of the dealers in this county have, for before he died he confessed to his mother that his master watered the milk. Poor fellow, he had not yet been long enough in the business to water milk with a clear conscience.

One more case of this character, and one of especial interest to us, some of my hearers producing milk to be used a hundred miles away, and a few of us the consumers, using milk, produced, we hardly know where, or by whom. I condense the main facts from a long " report on an outbreak of enteric fever in the districts of St. Marylebone, and the adjoining district,'' in the western suburbs of London, in July and August, 1873. (Rep. Med. officer of the Privy Council to Parliament, 1874. New series, No. II., p. 103.) The report extends to 244 cases of fever, distributed in 143 households, by far the greater number well-to-do people, in comfortable homes, many of them wealthy; in the classification only twenty-six out of the whole 143 not so classed. These were situated in eighty-eight streets. On examination it was found that 218 out of the 244 cases (about nine-tenths of the whole number,) used the milk from a particular dairy, and that women and children suffered most during the early stages of the epidemic. These eighty-eight streets embraced a population of 23,000 persons. The particular milk supply went into seventy-seven of the streets. In these seventy-seven streets, 132 houses had the fever in them, and this milk went into all but fourteen of them. In the houses in which this milk entered, 760 persons lived, and, as already stated, 218 of these had the enteric fever, while out of the whole 23,000 persons within the infected district there were only fourteen other cases. Moreover, certain families who only occasionally used this milk, took the fever.

Now let us go back a little. I have said that women and children suffered first; twelve women, and twenty-two children being among the earliest cases. It was found that "nursery milk" was a specialty of this dairy. This was collected from three or four cows, selected and set apart from the general herd, for this purpose. It was designed to meet the wishes of those customers who had an objection to the mingled milk of many animals, for nursery or other uses. This was sent to London in separate parcels, and issued to customers on special request, in "sealed" cans, in the quantities required. Although designated for convenience "nursery milk," this milk was not invariably used for nursery purposes. Suspicion first fell on this milk; hence the investigation. I have given only a part of the proofs, but it seems to have been clearly established that the infection was spread through the milk of this dairy; so we will next turn to its production.

The milk came from "Chilton Grove Farm," some forty or fifty miles from London. Chilton cheese, like Orange county butter, is a household word, and we may believe that "Chilton nursery milk" suggested purity and excellence, even as "pure Orange county milk" does on the milk-carts that cross the East River from Long Island. This farm was between the villages of Brill and Chilton. The local health officers aided the London officials in their examination of the premises. Typhoid fever is rather common in these villages; the "occupier" of the farm died early in June of enteric fever, and later there were other cases on the farm. (A plan of the farm buildings and surroundings, and section of the dairy were shown.) Water for dairy purposes was all derived from a well by the farm house. The only privy was fifty-six feet distant, on the upper side, and the drainage of the farm yard was through an open ditch, that passed near the well. Extensive excavations were carefully made to see *how* the water became contaminated. It was found that the drainage from a pigsty soaked along a wall to near the well; that against this wall was the ash heap of the farm; that in this ash heap the evacuations of the "occupier" of the farm (who died) had been buried; that upon it were cast the chamber slops from his sick room, and from this, by an underground channel along the wall, they had soaked into and contaminated the well. The officers state, "in other words, by an unhappy and unforeseen chance, and in carrying out precautions to obviate any possibility of mischief, the matters from which mischief was most apt to arise were deposited in perhaps the only spot on the farm premises where they would certainly find their way into the water used for dairy purposes." The water was examined, and found impure. How the water of this well contaminated the milk is unknown. The interest of the case lies in the number of persons made sick; in the complete chain of evidence that the epidemic in London, spread through the milk; in that the milk came from a place in the country fifty miles away; in that fever existed at the dairy farm, and that the well-water there was infected. The only missing link is as to how the infected water got into the milk, whether by the owners dishonestly watering the milk, or by honestly washing and rinsing the milk vessels and utensils in the polluted water.

I have used more than my hour, yet have left unsaid many things I had hoped to say, and other illustrations I had hoped to give, but if I have impressed on you the importance of the subject, my end is gained.

The CHAIRMAN. Gentlemen can make any inquiries they desire of the Professor, and he will be happy to answer them.

Mr. N. HART. It is suggested to me, that I ask what is the best pipe in which to conduct water, in a sanitary point of view?

Prof. BREWER. In a purely sanitary point of view, I should say iron; but iron pipe sometimes rusts, and the condition of the water may be such that it carries iron rust into the wash-tubs, of course, coloring the linen.

Mr. N. HART. Cannot that difficulty be remedied by galvanizing?

Prof. BREWER. Water comes through galvanized iron perfectly clear, so far as rust is concerned. The Massachusetts Board of Health have investigated that matter, and they claim that galvanized iron pipes are unhealthy. I suppose you all know that what we call galvanized iron is iron that is covered with zinc. It is a law of chemistry, that where you have two metals in contact, if you put them in a solution of acid, or any thing that will eat the metals, only one of the metals will be attacked, unless they are some distance apart. Now, suppose I have an iron rod covered with zinc, even if it was not covered entirely, the iron would not rust as long as the zinc is there. Block tin has every quality that is desirable, but it is too expensive for general use. With regard to lead pipe, in some cases, the lead is not taken up in sufficient quantities to do any damage; in other cases, it is, so that no general rule can be laid down. In my own house, the water is brought from the street main, in an iron pipe, and we have never found any contamination from that cause. Plumbers, the world over, as near as I can get at it, are supposed to be men of large bills and weak consciences, as regards their bills. It is generally believed that it is vastly cheaper to put in iron pipes than any other kind. I know some houses that are plumbed with iron; that is, they are supplied throughout with iron pipes. I know one man who put in iron pipes and afterwards changed them solely on the ground that the water which went into his wash-tubs was contaminated. I may state, that the water for my own house is brought from the street through iron pipes which are not galvanized, and the distance from the house to the street must be sixty or seventy feet, and there has never been a time when we have seen a particle of rust, a part of the pipes in the house being galvanized, and a part not.

Mr. N. Hart. Will a stream that is always running through iron pipes be contaminated?

Prof. Brewer. A stream that is constantly running will not be contaminated in the manner I have stated.

Mr. Gold. In one instance I laid down an iron pipe, five-eighths of an inch in diameter, and a continuous stream was allowed to flow through it, with a moderate descent. That became filled with iron rust; a sort of "cider emptyings," in the course of a few months, so as to render it perfectly valueless, and the pipe was given up. There were two cases the same season, under similar circumstances, in the same neighborhood, with pipes of that size.

Question. Hard or soft water?

Mr. **Gold.** The common spring water of our hills, called soft, but not as soft as rain water. I have never examined the water. The pressure was not sufficient to force this accumulated "cider emptyings" through, and it coagulated, or curdled like sour milk, until it obstructed the flow of the water, and finally entirely stopped it.

Prof. **Brewer.** I rather think, that if you had had a barrel or something of that kind sunk at the spring, so that the water would have gone into the pipe, under a little pressure, it would have gone through with sufficient velocity to clear it.

Mr. **Gold.** We gave it up after two or three months trial. It was an even descent of about one foot in twenty.

Mr. **Clark.** There have been miles of iron pipe laid in this village that have been filled with an accumulation like that described by Mr. Gold, and we have had to take them up. We have taken up miles of such pipe, of large and small sizes. It became utterly useless for carrying water in from three to five years.

Prof. **Brewer.** Your mains are of iron, I suppose?

Mr. **Clark.** I am speaking of the small supply pipes, from half an inch to an inch and a quarter in diameter.

Mr. T. L. **Hart.** Is it not a fact, that some water will rust iron or tin pails much more readily than other water?

Prof. **Brewer.** Yes, sir.

Mr. **Clark.** A single one and a quarter inch pipe will supply a dozen houses, and one house or another must be drawing water all the time; but the pipe became filled with rust, and that, too, under a pressure of 150 feet, and the water as pure as almost any we have.

Mr. **Bills.** I have seen cases where water has been running through iron pipes constantly, but in five or six years, the pipes have been entirely obstructed.

Prof. **Brewer.** In my own house, as I have said, there has been no obstruction in the flow of water. I imagine there is a difference in water in this respect.

Mr. N. **Hart.** I want to enquire if, in the evaporation of moisture from the earth, which descends in the rain which we catch in our cisterns, any deleterious substance is carried with it, so that the water is contaminated in that way?

Prof. **Brewer.** There has been a theory put forth that such is the case, but it is only a theory; there is no proof whatever of its truthfulness. The trouble is, that the roofs of your houses are not clean, and the rain water becomes contaminated in that way. You are living in town, perhaps, and your neighbors keep doves, and they get upon your roof, and their manure washes down into the cistern. Rain water is perfectly good for drinking, provided it is filtered through charcoal. There are numerous filters that may be used to remove any unpleasant taste that may come from the dirt that accidentally gets upon the roof in this way. Sometimes, where there are manufactories, the rain water may be infected by smoke.

Mr. N. **Hart.** Now I want to bring this matter right to a practical point. In view of these difficulties, I built a cistern this fall, in which I put a partition. The lower part of the partition wall is built of brick, and I left a small passage in this. On one side of this partition, by the opening, I have placed charcoal, small pebbles, sand and stones, from the size of my fist down to a hickory nut. I want to know if that will make an effectual filter, so that the water will be safe for family use in cooking, and how long it will last?

Prof. **Brewer.** Yes. I don't know how long it will last. That will depend upon the amount of impurity in the water. Such a filter is effectual while it lasts, and it may last a good while. I know one or two cases where city water gets a fishy taste, smells bad, and tastes bad; I don't know that it is any more unhealthy. So far as chemical analysis can determine, it is not. It will take but a small amount of impurity to give an offensive smell to water. I know some persons who have prepared filters for water they wish to use for cooking, by having it in a separate vessel, in which the water is placed and boiled for a time. A great variety of filters have been devised in excessively hot climates, especially in India, where they are so arranged that they can be easily cleaned. In places where an arrangement is used such as that to which Mr. Hart has referred, there is usually some means adopted by which the filter can be easily removed, and frequently emptied. One plan is, to put the filter between two brick partitions, or something like that.

I ought to have stated, inasmuch as two or three have spoken to me about it, why I said nothing about consumption and drainage. Much has been written on that subject by Dr. Bowditch, of Boston, who has investigated the matter thoroughly, and I understood Dr. Knight was going to have something to say about it here. A great deal of attention has been paid to the relation between consumption and drainage, and the attempt has been made to show that it was the same as the relation between typhoid fever and drainage. In the case of typhoid fever, we speak of the poisoning of water through filthy and imperfect drainage. In the case of consumption, there are a number of eminent men who believe that the existence of water near the surface of the ground increases enormously the liability to consumption. I might here remark, that one of the most noted chemists in the world, and one who has given a great deal of attention to this subject, Pettenkoffer, of Munich, has for a great many years attributed the presence of many diseases to what he technically calls "ground water"—water that stands near the surface. He has been writing and publishing, from time to time, for a great many years, upon the subject; but while he certainly makes out a very strong case, it does not seem to me he has proved what he wants to. In the case of consumption, I do not think the relation between that disease and imperfect drainage is proved. This is true, however, that on low lands, it is apt to be more common and more malignant. I have in my mind's eye a sea-captain, who came home to settle down, and bought a beautiful little place in New Hampshire. He was a person of some means, and he took the house because of its picturesque surroundings, and every person who has visited it has fallen in love with it. It is covered with vines; the limbs of trees overshadow it; vines grow over the windows, mosses grow on the roof, and all that. All this was exceedingly poetical, but it was very unfavorable to the health of the household. There were nine or ten children. The old man, giving up his hard sea-work, settled down there, and in a short time died, by a mysterious dispensation of Providence. Those mysterious dispensations kept happening, until all the children were cut off but two. One of the two went to sea as a captain, and got so weaned from the old place, that when he came home, it was to settle down elsewhere, and he is a strong, hearty man. He went to sea because he thought he had the consumption, and it would do him good. There was one girl belonging to the family, and she too was consumptive; but she had some money, owned an eighth of a ship; the captain of the ship got acquainted with her, and to show his sympathy, married her, and she went to sea with him. The sea voyage rejuvenated her, and when she came home from San Francisco, the consumption had all left her. All who staid in that house died of consumption. The house was embellished with the many beautiful things which the old captain had brought home from distant lands, elegant furniture, rare old pictures, every thing that wealth and taste could bring together. But the house stood on low ground; it was shaded and damp.

QUESTION. If this place had been divested of its vines, shade-trees, moss, etc., do you think the result would have been any different? Might there not have been some other cause?

Prof. BREWER. I cannot answer that question. I simply state the facts. We can never tell what would take place, if something else had not taken place. It was a shaded, damp house. Every thing about it was damp, as was shown by the moss on the roof, and the moss on the wall back of the garden.

Mr. ———. I have known a number of remarkable cases, where whole families have been carried off by consumption, the parents apparently healthy, and the children apparently healthy until they became of age, and then they all dropped off from consumption. They lived on elevated ground, where the drainage was perfectly good, and there was no local cause, apparently, so far as water was concerned, except surface water running into the well, which could not be the cause in the case I have mentioned.

Prof. BREWER. I do not believe that damp soil will account for it. If so, the disease could not be limited so geographically as it is. In that case, there would not be whole states where consumption is so rare, and other states where it is so common. I am inclined to believe, that while water in the soil aggravates the disease, makes it more malignant, the climate, also, has something to do with it. I know places in Utah and California where they have it, and where they have plenty of sunshine.

QUESTION. How can you find out whether there is lead enough in water to be injurious to health, without waiting until its deleterious effects are manifested?

Prof. BREWER. I do not know any way. The amount of lead which will produce deleterious effects is marvelously small,—so small as to be almost incredible. The late royal family of France was poisoned by lead so that their health was affected, and as near as I recollect, I think the amount of lead obtained was only one-tenth of a grain to a gallon of water. There may be lead poisoning from other sources. I knew a case which bothered the doctors a good deal. The patient was a milkman, who was unquestionably poisoned with lead. They went to his house and examined every thing about it, and they could not find any possible way by which lead was taken into his system. None of the rest of the family were affected. At last, the source of the evil was accidentally discovered. It appeared that when he started on his route, as he came through the suburbs of the town, he would stop at a certain place and take a glass of beer, and as he was the first customer in the morning, he would get the beer that stood in a lead pipe all night. I believe there was a complete cure effected in that case by letting somebody else drink the first glass of beer!

QUESTION. Will lime act as a disinfectant of the water that runs from the sink-spouts at the back of farmers houses?

Prof. **Brewer.** Lime acts as a disinfectant. The air is continually doing this work, so that this material is less liable to do damage on the earth than when it is covered up out of sight. The material carried down in a covered sewer is more poisonous than in an open sink. The trouble is, that the disinfectant is not used. The real fact is, that it is not generally poisonous; it only becomes poisonous on particular occasions. In the case of the Maplewood school, about which so much has been said, and which comes home to us, there had been trouble before, but why disease should so suddenly break out there with such fatal effect is absolutely unknown to us. My own belief is, and the probabilities are that the water became contaminated. That is a mere hypothesis, but I believe that from some cause the water became poisonous. You find many cases of that kind where sewage which had been perfectly harmless for years, all at once becomes deadly. When I say "deadly," I do not mean deadly in the sense in which strychnine is deadly, but we know that very many have been killed off.

Mr. ———. A constant running of pure water with this sink drainage would be an effectual remedy for any impurities. For instance, I have a spring running into my house, and a large flow of water constantly running into the sink, and to the same outlet with the sewage. We have never had any trouble.

Prof. **Brewer.** It is entirely according to the degree of contamination. That is the way we get rid of filth in cities, but the sewers sometimes get contaminated, and there is much discussion at the present time in reference to sewer gas getting into houses. There is no probability of sewage doing any damage, provided it is carried off perfectly. I am inclined to believe that very frequently damage comes where they have tried to do the work well, but where it has been, through somebody's fault, badly done.

Mr. **Gillette.** I should be very sorry to have water go out from this meeting with so bad a reputation; I should be afraid somebody would go to drinking something else; beer, or fire-water, or something of that kind. It would be a great misfortune to humanity. I have been using lead pipe for the purpose of conducting water with perfect confidence, on the supposition that as the pipe is used it becomes coated internally with a substance which isolates the water from the pipe, and prevents any corrosion. I think Prof. Silliman has testified to this point, so that in Hartford we have been drinking our best River water with perfect confidence. I have understood that lead pipe was universally used in places where the water was perfectly safe. If there is any danger connected with it, I should like to be informed of it.

The **Chairman**. We have used a lead pipe some thirty or forty years, and have scarcely had a case of sickness during that time.

Prof. **Brewer**. I have known a family that lost three children in two years, simply by using water that came through a one-and-a-quarter inch lead pipe. There are certain ingredients in some water which act upon lead. Sometimes water affects lead and sometimes not. Water containing lime hardly affects lead. There are certain kinds of soft water that act upon lead very materially. All the idea I wish to convey is, that if you are using lead pipe, you want to find out whether *that* water acts on the lead. I do not know but I have, as Mr. Gillette says, been giving water a bad reputation; I did not mean to. As a steady drink, I do not think there is any thing that can compete with it, and I have no idea that any thing will. But I am talking against allowing our wells of pure water to become contaminated. I am talking about this important source of disease, and I verily believe that more of our farmers suffer from bad water by allowing their wells to become contaminated through *carelessness*, than through ignorance.

Mr. T. L. **Hart**. Are all domestic animals liable to be poisoned by lead?

Prof. **Brewer**. Not that I am aware of. There have been a great many theories devised in regard to lead poisoning. The lead poisoning of which I have been speaking is a specific disease. You will find it frequently laid down that lead poison is the cause of paralysis. That paralysis has increased enormously in the city of New York since the introduction of Croton water, is unquestionably true; but whether that has anything to do with lead pipe is another thing.

Mr. T. L. **Hart.** I knew an instance of this kind. A man was painting his house, and four out of seven swine ate some of the white paint. He said, "Those four will die." But the painter said, "No; lead won't poison swine. They won't eat anything that will poison them." And sure enough, they were lively the next day.

Mr. **Gold.** Are you sure it was *pure* lead?

Mr. T. L. **Hart.** Soon after that, a cat came along and licked up a few drops, and was speedily dead. Will not boiling the water, which is contaminated with these deleterious substances, wholly remove the evil effect?

Prof. **Brewer.** It diminishes it enormously. After our war, I collected a great amount of information on that matter, which I am very sorry to say I did not write out. I inquired of every person who had had much experience in the swamps of the South, and every person I knew who had visited Andersonville, and such places, and the proof was almost overwhelming in regard to the matter. One man, whom I knew well, who was one of the first prisoners sent to Andersonville, and remained there until the end of the war, came out without ever having any bowel troubles. He told me that he never drank impure water without boiling it. He was one that was often detailed to bury the dead, and he would bring in roots and wood for the purpose of making a fire to boil his water. There is a very large amount of such testimony, showing that where water is boiled, it diminishes enormously the chances of contamination. During the cholera outbreaks to which I have referred, in London, the health boards have distributed circulars to the houses, and posted placards in public places, asking people to boil their water before drinking it. I do not believe that it would be a specific against all poisons, but I believe it would diminish enormously the chances of spreading the infection.

Mr. N. **Hart.** The subject of drainage, of getting rid of house waste, is something that puzzles me more than anything else. I have tried stone drains, and wooden drains, and tiles, and I have had to dig them up about every year on account of their filling up. I have never found any way by which I could secure a permanent drain. If any one present has had any experience in that line, I would like to know it.

Prof. **Brewer.** A constant stream of water will do it.

Mr. N. **Hart.** I tried it in this way. I laid a tile drain, and then ran my gutters into it from the eave-troughs. I waited to see if I could not get force enough to wash the sediment from this tile drain; but it would fill up.

Prof. **Brewer.** Those of you who have read the "Sparrowgrass Papers," will remember that Mr. Sparrowgrass, who went into a rural district from the city, and was supposed to be immensely rich, gives his experience in the matter of drainage. Somebody told him that the great thing in a drain was to have it flaring. So he called upon a builder, and told him to sink a drain, and make it eight inches square at the top, and make it flaring. "How much?" "Well, about an inch to the foot." In due time the drain was built, and he saw something that he thought was a shot-tower. It was 108 feet long, flaring an inch to the foot. The consequence was, it was eight inches square at the top, and nine feet square at the bottom! He says "it was rather expensive, but it never choked!"

Mr. ———. There is one way to clear a sink drain which seems to me perfectly practicable. Almost every farm-house has a cistern connected with it, and it is a very easy matter to connect a hose with the cistern, and throw water into the sink spout. In that way, by pumping pretty vigorously—one man can do it, but two will do it much more easily—you can give your sink drain a thorough washing at pleasure. I have adopted that plan, and found it very beneficial.

Mr. ———. I know of one case where a large portion of the wash from the kitchen and the slops was turned into a hogshead just outside the back-door, and this was used for watering the garden during the summer. Gypsum, muck, or dirt was frequently thrown into the hogshead. It required a certain amount of care and labor, but the owner of that house stated that it paid for itself several times over in the value of the manure that was obtained in that way.

Mr. ———. I was going to say that I have introduced into one of my drains the conductor from one of the eave-troughs. The drain is so short that I do not think it would clog up anyway. It strikes me that is one way by which drains may be kept clean.

Mr. GILLETTE. I have one tenement where the occupants have been troubled a good deal by the drain filling up. I therefore had the strainer soldered down tight over the sink-hole, and have had no further trouble. But where the women have found the sink strainer loose, so that it could be pulled up at their pleasure, I have had a great deal of trouble.

Prof. Brewer gave a description of an arrangement for sinks devised by Col. Waring, which he said struck him as a capital one, but it could not be made intelligible in print without a number of diagrams.

Mr. ———. Prof. Brewer spoke of that beautiful little cottage, with its vines, and mosses, and trees, and the fatality attending its inmates. While we are paying so much attention to water, would it not be well to show that the sunlight has much to do with the prevention of consumption. If the sun had been allowed to penetrate that house, would it not have done more to restore the health of that family than a change of the water? And has not air more to do with consumption than water?

Prof. BREWER. I stated, I believe, that I thought the importance of water in consumption had been exaggerated. My own belief is (it is mere belief, worth no more than any one's else) that things above ground have more to do with this disease than things below ground. If they had cut out the trees and vines around that house, and let in the sun and air, the sun would have faded their carpets that had come from India, but some of them would probably have enjoyed life to this day.

Adjourned to 7½ o'clock.

EVENING SESSION.

The Board met at 7½ o'clock, and the chairman introduced as the lecturer of the evening

DONALD G. MITCHELL, ESQ.,

of New Haven, who read the following paper on

FENCES AND DIVISION OF FARM LANDS.

The subject assigned to me by the secretary of your Board is, "Fences and Division of Farm Lands."

The latter subject—embracing, as I suppose it does, the proper lay-out of a farm—is a very broad subject, and a very old one. The earliest writers on Rural Economy indulged in talk about the best lay-out of a farmer's lands: and centuries later, when the German, French, and English languages began to show treatises on the practice of agriculture, the writers followed up the same question of proper Farm Divisions, accompanying their suggestions in many instances with elaborate plans—sometimes complicated, sometimes very promising and ingenious; and if our surfaces, and exposures, and conditions tallied near enough with theirs, some of them might be very profitably adopted even now. But here lies the difficulty; not only with the old plans, but with the harmonious and beautiful new plans which are offered to our acceptance in modern books and journals. Land is not so even as a sheet of paper. *The only good lay-out is that which makes the most of a man's special territory, and which shows perfect adaptation to his individual farm wants*—whether of grazing, dairying, tobacco-growing, or fruit-raising.

It is quite true that on the level stretches of much Western land, where grain-growing or stock-raising are almost the universal aims, it is quite possible to forecast and elaborate a plan in advance that shall show the best possible disposition of fields, inclosures, and buildings. But what shall we say of our Connecticut farms, on which crops, and surfaces, and conditions vary in almost every township,—thus blockading the effort at any uniformity of design?

Consider, again, that if there were reasonable uniformity of surface and similarity of aims in regard to cropping, what a multitude of disturbing conditions there are in an old settled country. We cannot make our farms, spick and span, out of new cloth. We cannot cut them out, as they cut out quarter sections in Kansas, or as we would cut a pie. We must take them as we find them, with the old lumbering walls, and the old buildings, and the old mossy orchards, and the crooked town roads, and the old rights of way.

In view of all this, what can profitably be said about the division of farm lands in Connecticut? This is the question which I suppose your inquisitive secretary proposes; and (as I said before) it is a broad question, and it is a hard one. All that I shall say in reply will not be a solution of it, but only stray hints toward a solution.

The man who comes into possession of a farm, whether by inheritance, by purchase, by barter,—whether matrimonial or otherwise,—naturally consider first what use he shall put it to? What crops can he grow with best hope of profit? In settlement of this point, he will be guided not only by the quality of his soil, exposure of his surface, but also by his nearness to this or that market, and by his personal aptitude or skill,—all which matters, though offering good subject of talk, are out of my range to-night.

Our land-owner having settled the question as to his special course of crops and farming, he will next, if a wise man, consider how he can make all its conditions,—of surface, of inclosures, of accessibility, of water-courses, of wood-lands, contribute to his scheme of cropping. He will begin to plot his own lay-out in order that he may work his land most economically, and have his farm, as the saying is, well in hand.

Nor is this so simple a thing as may at first sight appear. It does not come of itself. It does not come, as trees grow, while we are sleeping. It does not come of following old cart-paths through the woods, which have been laid down for generations; it does not come of patching old walls, without considering the necessity for them; it does not come of allowing the venerable stock of rhubarb and fennel to grow in the old garden patch, simply because they are *there*. It comes of thought; it comes of careful study, and comparison, and knowledge of all the irregularities and capabilities of the farm area.

Now this knowledge and study of capabilities, is an easy matter, when land is even and lies in such gentle swells that it can be conned over like a map. But the average Connecticut farm does not have such surface. It has its hills, its cliffs, its swamps, its heavy timber, its deep swales, to the thorough understanding of which, and of the relation, which part bears to part, a good surveyor's map is almost essential; and this every farmer who is ambitious of making the most of his opportunities should have; a map that should show the elevations, the swamps, the wood-land, the water-courses, and the trail of his cart-paths, and position of buildings. No tramping over irregular surfaces can supply the lack of it. There is nothing like the figures in plain black and white to show what a man's profits are, or his losses.

Many a farmer has drawn his manure, during years past, miles of unnecessary distance, for want of that judicious layout of his farm-road, which is only possible, after the fullest study and comprehension, of the actual surfaces and distances. Many a herd of cows toil their round-about way, summer by summer, to pasture, whence some short cut through a spur of wood, or across an intervening bit of meadow, would halve the distance. It is not enough considered, that good engineering and good sense contribute as much to shorten and cheapen travel across a farm, as across a State or a continent.

This blindness as to actual topography is not stupidity; it is almost inevitable when that clear understanding of the surface, which a survey only will give, is lacking. Every one knows how, in a wood that is perfectly familiar to us, we lose our reckoning in regard to elevation and distances, and how when heavy timber is cleared up on uneven ground, the newly developed surface is almost a revelation to us. It is within my knowledge that an ambitious farmer brought water into his cattle yard through a pipe one-third of a mile in length, when he might have found ample supply and ample fall within twenty rods. Irregular surface and intervening wood, had totally deceived him in regard to levels.

Hence I say, before all, and first of all, in making large irregular and wooded surfaces manageable, and in bringing them into conformity with a well-ordered system, mapping is necessary. I need not here dwell upon the incidental advantages of knowing levels accurately, length of fence lines, size of particular inclosures, area of wood, position of drains and cess-pool, name and place of fruit trees—all which thus become matter of record—as will also boundary lines; and in the case of quarrelsome and pragmatical neighbors, (if one chance to have them,) there is no confinement better than that of a Gunter's chain.

With this general view of what may be counted the primal necessities, I pass on to consider some of the individual aspects of a good division of farm-lands.

And first: of wood-land, of which the average Connecticut farm always possesses its allotment. This, to be sure, we do not plant (though we may come to that). It is for the most part established by the same Designer who rolled up the hills, and who fashioned the valleys. But we can largely modify it, by our clearings and by the order of our treatment. The land most profitably kept in wood will be steep declivities, the river banks, the mountainous heights (if we have them); and in all clearings it should be kept in mind that wood has great value in giving shelter to adjoining fields, and hence should be left, wherever practicable, as a defence against north and northwesterly winds. If happily a wood stands in such proximity to the homestead as to offer this shelter, it should be religiously guarded. Such living defence against the north winds in our climate will contribute largely to that cheery atmosphere of home which makes a place inviting, and will count largely among those accessories of situation and shade and comfort which make a homestead enjoyable to its inmates, and keep them in that blessed state of content, that brings the best sunshine everywhere.

It is very much the way with our New England farmers to make their clearings of wood-land in rectangular blocks without regard to surface, allowing all to grow up in wood again, and making no account of those broad glades and swales lying between the heights, which from their sheltered position might be brought into a most profitable condition of tillage.

Second. I call your attention to land in permanent pasture, as another recognized farm division with Connecticut agriculturists. I am aware that those who have alluvial flats, and all their area easy for tillage, question the propriety of any permanent pasture; but this I doubt very much, if land natural to grasses, and far away from market, can be kept in any crop to more profit than grass year after year. Good pasture land, fed upon by sheep or young stock, has a wonderful way of keeping itself alive; and if depastured by cows brought away at night, a little sprinkling of superphosphate or bone-dust, makes good the waste. There are thousands of acres of land in Ireland, fed upon from time immemorial, that are as green and luxurious to-day as in the time of the battle of the Boyne; and there are meadows in Somersetshire from which the grass has been taken, year by year, for half a century. But however you may settle this question, it is certain that there are hundreds of acres in Connecticut, which by reason of uneven surface, or cliffs, or boulders, must remain in permanent pasture, as a matter of economy. The sheep and grazing cattle can crop herbage where neither plow nor mowing machine can easily go. A judicious division of farm lands will be made in recognition of this fact; and the line of demarcation between the pasture and the arable land should be laid down accordingly, keeping in mind, however, the importance of bounding arable fields with straight lines, for the more economic working of all farm implements.

Another consideration in regard to land in permanent pasture, is that access should be made easy and direct from them to the cattle yard. This is specially important upon a dairy farm. Absolutely free or open communication between the pasture and cattle yard, which can often be brought about by the dexterous change of a few lengths of fence, will save a great many steps, and a great deal of time. It is often, also, the best possible solution of the water question; since water should always abound in the cattle-yard, wherever else it may be wanting. When a highway or railroad intervenes between pasture land and barn, of course the bars and gates are inevitable, but they are none the less nuisances.

Again, a modicum of orcharding belongs to most Connecticut farms, and there can be no better placement for it, under ordinary conditions, than near the homestead, upon its northern flank if possible, thus affording a measure of grateful shelter, and it should be itself sheltered in turn by a belt of evergreens along its northern border. Such a belt will be of more worth to a home orchard than any single row of trees. The orchard too,—of course I do not speak of commercial orchards of large area,—should have its special inclosure, and if practicable have one of its angles contiguous to the out-buildings, so that in the months of June and July, the swine may be given a run through it. There is no better aid than this in combatting that great enemy of the apple crop, in our eastern States, the codling moth. The pigs will lessen the ranks of the enemy by devouring the wind-falls. I know that it is quite possible, and highly recommended, to gather them by hand, and transport them to the hog-yard; but I know too that the pigs, if admitted, are a great deal better gatherers of such droppings than most farmers prove to be. Farmers are forgetful and careless; pigs have a good memory, and a quick eye, where grub is in question.

As regards arable and grass land; how and where it should lie? Nature will determine more than we; but whether massed together, or in separate bodies, its inclosing boundaries should be so far as possible, right lines, for economy or tillage. The division of it into distinct inclosures, if desirable at all, should be in agreement with the rotation of crops adopted; thus there may be one or two fields in hard crops; an equal number in white crops, (small grains,) and four in grass, all to be taken up in their turn; it is also recommended by all the standard rural economists that these fields be, so far as possible, square in shape, as being the form which involves least cost in fencing. But in case the arable lands lie together in one mass, I question *if it is not much better economy to abandon the subdivisions altogether, and take up the land strip by strip, thus leaving long stretches* for the mower, and plow, and rake, and tedder, and doing away with those frequent turns upon the headlands, which are a worry to both men and horses. There is the gain too of all the ground occupied by the fences, and the saving—no small one—of their cost. It must be remembered that this system of subdivision originated in a time when mowers, and horse-rakes, and tedders were unknown. In the old times a man with a scythe wanted his breathing spell at the end of a swath twenty rods long, if he did not want his sip of black jack; but a Buckeye takes its hundred rods easily, with only a pinched out drop from the oil-can.

The only appreciable loss in this abandonment of the division fences, is that of the after-feed. But is not this balanced by the gain in time, and ease of work? Consider, moreover, that the value of the aftermath, as a winter dressing, to keep the grass roots warm, is worth much; and consider again, that if the after-feed must be secured and cropped, it can be done by herding—either by boys, or trained shepherd dogs, the only dogs, let me say, that ought to escape State taxation, —that ought, indeed, to have a bounty declared in their favor.

And now I have a word to say about the way to reach these tilled fields, or this one great field, and all the remote parts of the farm. *Above all things, the land from which a man is to reap his harvests must be accessible, easily and always accessible to himself and his teams.* There should be no wallowing in mud to reach them, no circuitous course through dozens of bar-ways. Trim and true, and sound and direct, must be his farm road—the great artery of communication. By it and through it, he holds all in hand. Whatever other divisions and partitions he may make, whatever other old rules he may follow for tradition's sake, he should *not* follow any old rut of floundering, and winding, and time-losing, and wagon-destroying, in this thing.

Again, a just division of farm-land must include a spot for a garden; we know what the average aspect is; a little rectangular inclosure, with artichokes, golden-rod, stray raspberries along its fence, and a disorderly array of currant bushes, bean poles, and cabbages, within; these being thrown into relief some autumn by a splendid burst of barn-grass, and ragweed, and cockles.

The neglect is, I think, due in a large degree to bad lay-out, to blind acceptance of the old notion that a garden must have its old accredited shape, with its wall or paling hemming it in —not large enough to invite a good bout of the plough, or cultivator, broken up with cross-beds and interfering tussocks of thyme and rhubarb; well, all this aggravates the man who is accustomed to long lines of tillage. He wants space; he wants team-room.

And the way is—to take it—even for garden. There is nothing holy in the old diminutive square pen of a garden, that we should swear by it, or at it. Why not make lines large and free? Take up a strip of land in the lee of the orchard, or on the flank of the arable fields, (if near by)—plant strawberries and berries all, and asparagus, in long lines, eight feet apart—setting the rhubarb, the thyme, the parsley, the sage, on the hither ends of the lines and coincident with them. Establish free and ample space for turning at either end of the strip—and the ground can be tilled as easy as a corn crop, and in the summer alternating rows of cabbages, beets, peas, what you will, can be set between the permanent rows, and all will grow as well as if it were penned up by pickets.

In the fall a thorough ploughing, and a heavy top-dressing, will ensure good condition for the next season's growth. You may soon ornament the permanent lines of such a garden with here and there a tussock of flowers, of phloxes, of peonies, of roses, which are as good for color as any we can put into our Sunday cravat. This would make a manageable garden, and the best of all forms for a farmer's garden.

Having thus touched on the matter of Farm Divisions, upon the Woodland, the Arable, and the Garden, there remains only that Area lying immediately about the Homestead and connecting it with outbuildings, cattle-yard, and all approaches to fields and highway—the great ganglion (as physicians would say) of the whole system of farm divisions.

I need hardly remark that this area should be as level as practicable, well kept, ample in size, giving freedom and breadth for all movement of in-coming or out-going teams, and having such accessories of shade, whether of fruit or forest trees, and of green turf, as shall make it grateful, hospitable-looking, and enjoyable to all the inmates of the homestead. The out-buildings, in connection with farm buildings proper, should be disposed about the home-yard in such a way as to offer an effective lea, or defence against prevailing cold winds. Hence it will come to be a cheery rendezvous for winter, where such repairs to farm utensils as may be made out of doors, can be effected, where a neighbor's team will not suffer, where the bees may have their bench of hives, the children may have their swing, the house-dog may sun himself, the pigeons (if you have them,) may coo under the eaves, and the tom-turkey, that politician of the crowd, may strut, and scrape his wings in the dirt, and have out his gobble.

I think we all recognize the charming and comfortable look of such a farm-yard, wherever we encounter it, and augur well for the thrift and contentment of those, who preside over it. In contrast with this, you may, if you have journeyed there, recall the pinched, narrow lane which leads from the highway up to many a farm homestead of South-western New Jersey, and of Pennsylvania. The farms are excellent, and well tilled, with far better land than ours: but the home-yard is as pinched as the lane leading up to it, so that the turning of a team is no easy problem, and the Dutch wife encounters the mire of the wheel-track at her very door. No tree, no shade, no bees, no swing—scarce a flower. They are thrifty, money-getting farmers: but, by this token, they do not cultivate the sort of thriftiness which gives a civilizing or a refining grace to so many of the farm homesteads of New England.

I come now to the last topic assigned me in the programme of our most worthy Secretary, to wit, Fences.

The subject having been already discussed, I shall make my comments very brief, and fear that, what I may have to say, will have been anticipated.

Fences, as the name implies, may be considered, 1st, as a barrier for the restraint of cattle, 2d, as giving shelter (under certain modes of construction,) against bleak winds, and 3d, as decorative features about a homestead. In this last view, I shall not discuss the topic. For restraining cattle, the usual fences are of boards, of rails crossed in Virginia style, of posts and rails, walls, and in scattered instances, hedges.

These last, however, have not met with favor for farm purposes, proper. The nice culture essential for the two or three first years, the cost and the time requisite to make them effective, and comparative cheapness of lumber, have forbidden their general introduction. Where determined on for defensive purposes, the best plants are the Honey Locust, the Osage Orange, and the Buckthorn, to which, I think, might be added as best of all, (if it were propagated,) our own native White Thorn.

The Virginia fence involves great waste of timber, and by reason of its entering angles, slovenly culture. It does not belong to Connecticut, and I think should never be seen here except it be around out-lying pastures.

The post and rail system economizes material, and is durable and substantial, and when put in shape at the mill, is not costly. In respect to the posts, three important facts have, I think, been made clear by experience and multiplied observation. First, that the timber should be cut, for best results, between September 1st, and last of November. Second, that such timber, after splitting or sawing, should have a year's seasoning before use. Third, that the top end (as the tree grows) should be placed in the ground.

As respects durability of different species, I think we may rate Locust, first; Red Cedar, second; Chestnut, well seasoned, third; Yellow-bark and White Oak, fourth. Birch and poplar and spruce and bass-wood and white-wood—no where.

The nostrums of applying salt, coal tar, and charring, are, I think, justly out of favor, as hardly paying cost. Kyanizing is unquestionably preservative: but a farmer does not want to deal with chemicals, of whose good condition he cannot judge, and of which he wants to keep no large stock on hand. For fruit growers, and hop-raisers, in making their stakes and poles durable, the system is worth attention.

Board fences are effective, and stand when pine boards, well nailed, are used. Chestnut, oak, and hemlock boards are inclined to warp, and draw the nails.

Considered as a shelter for early spring crops, in fruit gardens, the board fence serves an excellent purpose. They have secured gardens, where else gardens had been impossible on the bleak eastern shores of Massachusetts. But for a family fruit garden, no shelter is like that of a close growing hedge of evergreens, either Norway Spruce, or Arbor Vitæ, or Hemlock. Its good influence can hardly be over-stated. To this end, a free growing belt is as good as a clipped hedge, and farmers can spare the room for it. I have never seen better pears, and surer crop, year after year, than where an accidental growth of Hemlock has intermingled its boughs with those of the pear tree.

Walls make good fences, provided the stones are proper and bind through, and provided they are laid up on a self-draining subsoil of gravel. On clayey lands, over swales, and through meadows, walls are a dreary resource, except the foundations be placed out of all reach of frost, which, in this latitude, would be, I should say some three feet; and having dug thus deep, it were better to make a drain, and bury the stones out of sight and for ever.

Even upon dry upland, the walls of fair-looking cobble stones carefully doubled, and capped with broad stones at top are a nuisance, and will bulge out with their interior and cumulative weight a great deal faster, than the pockets of the farmer who builds them.

I was reared in the county of stone walls—New London, where over 70 per cent. of the inclosures are of walls: and there are scores of farms there which could be bought to-day, four times over, for the cost of the walls upon them. I know what it is to bother and worry, and strain teams and break bars and break—hasty words—over the lifting of a huge boulder which when in place, by reason of its huge bulk, will serve only as a stepping stone for sheep to mount the wall. Better by all odds if much of that grievous labor had been spent in burying the boulders where they lay—by all odds the most economical way of clearing a rough field, and the stones never come up to perplex you.

In old times—before our recollection and before yours, I daresay—we will say about the year 1250, people built cities with walls, and did not consider them safe to live in if built in any other way. Now, what if some disputatious person had in that day sent a letter to the newspapers (which they didn't have) setting forth that it was all folly to wall in the towns, and it would be much better and cheaper to let every man look out for his own house? what a stare of wonderment the old people of 1250 would have put on!

Well, there have been those who said and say that our whole fence system entails an idle waste of money.

In 1842 Nicholas Biddle told the people of Pennsylvania that their fences cost $105,600,000 and involved an annual tax of $10,000,000, and advised their abandonment, and the adoption of the European herding system.

In 1854 the cost of fencing in Vermont was carefully estimated at $4,700,000 and annual tax at $855,000.

In 1862 the cost in New York was estimated, by Hon. Mr. Peters, I believe, at $144,000,000 and annual cost at some $15,000,000. And as late as 1871, from very full reports from intelligent observers in all parts of the Union, Mr. Dodge, the statistician of the Agricultural Department, compiled and tabulated a statement placing the whole cost of farm fences in the United States at no less a sum than 1,700,000,000 of dollars, and the cost of annual repairs at $198,000,000.*

These figures are something frightful: and yet, somehow, they do not frighten us. Great masses of figures showing idle spending, I have observed to have very little effect upon the individual spendthrifts. I rather think they enjoy being in so great a company. Zealous reformers, you know, not infrequently get together a great budget of figures, showing the enormous expenditure for alcoholic drinks and tobacco in

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*We append, in form of note, the following table of Mr. Dodge's arrangement.

AMOUNT AND COST OF FENCES IN THE UNITED STATES.

STATES.	Acres Fenced.	Rods of Fencing.	Total Cost of Fencing.
Maine	4,377,925	31,214,605	$31,214,605
New Hampshire	3,288,117	28,771,023	34,525,227
Vermont	4,164,917	32,278,106	42,929,880
Massachusetts	2,481,767	21,095,019	36,916,283
Rhode Island	448,988	4,489,880	9,877,736
Connecticut	2,185,000	19,883,500	33,801,950
New York	20,549,909	169,536,749	228,874,611
New Jersey	2,736,251	25,310,321	40,496,513
Pennsylvania	16,374,641	156,377,821	179,834,494
Delaware	963,770	6,023,562	7,228,274
Maryland	4,112,936	25,911,496	32,389,370
Virginia	8,165,040	40,825,200	36,742,680
North Carolina	8,902,909	49,856,290	37,392,217
South Carolina	5,284,224	26,421,120	21,136,896
Georgia	11,035,877	60,255,888	45,191,916
Florida	736,172	3,415,838	2,459,403
Alabama	7,536,947	45,975,376	36,780,300
Mississippi	6,437,137	27,035,975	25,954,536
Louisiana	2,045,640	8,182,560	8,182,560
Texas	6,822,757	30,020,130	33,022,143
Arkansas	3,294,189	19,435,715	18,463,929
Tennessee	10,027,762	65,681,841	62,397,748
West Virginia	4,067,289	36,605,601	32,945,040
Kentucky	13,381,978	80,291,868	76,277,274
Ohio	18,090,776	155,580,673	155,580,673
Michigan	7,558,040	60,464,320	57,441,104
Indiana	14,111,963	95,961,348	100,759,415
Illinois	22,606,406	107,380,428	128,856,513
Wisconsin	8,807,332	46,238,493	39,302,719
Minnesota	1,857,681	7,430,724	6,539,037
Iowa	7,517,173	31,572,126	34,729,338
Missouri	12,274,766	64,442,521	64,442,521
Kansas	1,576,802	6,701,408	7,371,548
Nebraska	517,624	2,070,496	2,174,020
California	4,974,504	24,141,642	29,598,298
Oregon	1,116,290	5,023,305	5,274,470
Nevada	74,115	296,460	444,690

COST OF REPAIRS OF FENCES.

STATES.	Cost per 100 rods.	Total Cost.	STATES.	Cost per 100 rods.	Total Cost.
Maine...........	$3.06	$955,166	Ohio............	$5.25	$8,167,965
New Hampshire..	3.80	1,093,298	Michigan........	4.00	2,418,572
Vermont........	4.00	1,291,124	Indiana.........	5.40	5,181,912
Massachusetts....	4.50	949,275	Illinois.........	9.50	10,201,140
Rhode Island....	5.75	258,168	Wisconsin.......	4.55	2,103,851
Connecticut......	7.50	1,491,262	Minnesota.......	5.10	378,966
New York.......	7.06	11,969,294	Iowa............	9.80	3,094,068
New Jersey......	9.80	2,480,411	Missouri.........	4.90	3,157,683
Pennsylvania....	6.32	9,883,078	Kansas.........	6.75	452,345
Delaware........	7.50	451,767	Nebraska. . ..	8.50	175,992
Maryland........	7.80	2,021,096	California.......	8.50	1,797,039
Virginia.........	3.51	1,432,964	Oregon.........	7.50	376,747
North Carolina...	3.40	1,695,113	Nevada.........	9.00	26,681
South Carolina...	4.00	1,056,844			
Georgia.........	4.00	2,410,235	Total cost of annual repairs...	......	$93,963,187
Florida..........	3.80	129,801			
Alabama........	4.65	2,137,853			
Mississippi.......	5.26	1,422,092	Interest on the original cost at 6 per cent.....	......	$104,852,995
Louisiana........	6.51	532,684			
Texas...........	8.50	2,551,712			
Arkansas........	5.92	1,150,594			
Tennessee.......	5.00	3,284,092	Grand total exclusive of rebuilding fences.....	......	$198,806,182
West Virginia...	4.50	1,647,252			
Kentucky.......	5.15	4,035,031			

the country: and the toper listens with lifted eyebrows, and —takes his dram; and the smoker ponders, and—well, he fills his pipe; he must have a smoke on that.

So,—to the statistics I have given, the farmer listens, surprised, wondering, and straightway proceeds to put a new fence around his buckwheat patch.

It looks almost as if fences were good for something. I think they are—in places: but that we have far too many of them.

They are not universal. There are very few throughout France; in Belgium still fewer; in Lombardy and through all of Northern Italy they are scarce known. In New Mexico there are none; in many of the southern counties of Illinois they are abandoning them, as also in many parts of Virginia under provision of express enactment with reference to the "no fence" system. Our highways in Connecticut ought to be safe and all adjoining fields. There is a good law against strolling cattle whether with or without keepers; but the people do not work sharply enough to its enforcement. I blush to say that in my own town the selectmen are the principal offenders—turning out the cattle of the town farm upon the highways.

There are few Connecticut farms on which there are not far more division fences than a sound economy or sound farm practice would warrant. To this point I have already alluded. Unfortunately, the cost of their removal will probably keep many of them a long time in place. But I am glad to observe year by year a more general clearing up and sweeping away of the cumbersome and useless and numberless yard palings and pickets which once encumbered the ground about every country homestead.

It is an augury of the day, it is to be hoped, when the inhabitants of our country villages will discard and tear away the multitudinous lumber devices with which upon their little lots they now barricade themselves, each man against his neighbor. They keep out no thieves, for thieves can climb them: they keep out no cattle, for cattle do not come there; they keep out no scandal, for scandal loves fences better than the open country. This is not fancy. A beginning, and more than one, has been made. There is a village in the suburbs of Cincinnati with not a fence from border to border. Its aspect charms and delights every stranger who passes through. In the thriving town of Greeley, in Colorado, there are no fences whatever. In the pleasant town of South Manchester, where the Messrs. Cheney have established their great silk works, these enterprising gentlemen, by their influence and example, have worked the abandonment of fences throughout the village. The result is a charming, park-like effect, which attracts the visitor, and in which every inhabitant feels an honest pride.

The summing up of the whole matter is—in respect to farm divisions, lay out your land for easiest and most economic working; make the most of any protection your wood lands may afford; give no land to permanent pasture which will pay better by tillage; make access easy to every field you own; order your homestead and its surroundings so that your children may love it and hate to leave it.

With respect to fences: abandon them as fast and as far as you can; if you will make them, make them good; watch your State legislation; see to it that it aids you, and when laws are made, see to it that they are kept. And when the barriers are down, and the great tax of their cost lifted, learn to trust your neighbor; and to live, so that he may trust you.

Mr. CHAIRMAN. If there are any questions which you desire to ask Mr. Mitchell will be very happy to answer them.

Mr. PHELPS, of Colebrook. How much would you decrease in size the walls we have in Litchfield county, by digging trenches in which to try to sink them?

Mr. GOLD. That question is referred to Prof. Brewer.

Prof. BREWER. I once heard the worthy Secretary of this society bragging of the place he lives in as being better than certain other farms in Litchfield county in this respect. Says he, "we can dig a post hole, put in the post, get the post to stand, and put every thing back that came out. But over yonder, if they dig a hole, they cannot put back the stones they dig out." I could not help thinking, that aside from sinking the fence, how Mr. Mitchell is going to get back all the stones that came out of the trench.

I would like to ask one question: Have you had any experience regarding the cutting of posts, I will say in June or early in July, just as the plant is in the most vigorous growth? In some parts of the United States, particularly in the southwest, in Arkansas and in Tennessee they claim that posts cut at that time last longer than those cut at any other time, before the growth is finished instead of after it is entirely finished.

Mr. MITCHELL. My experience has been quite the contrary. I have frequently had occasion to cut timber both for burning and for post making in the spring, and I have always found it was very liable to decay when cut at that time.

Prof. BREWER. I mean, after it has commenced growing, and is in full leaf.

Mr. MITCHELL. I cannot say as to that definitely, but I should say that timber should not be cut when the leaves are young. I have observed the fact to which I have referred, to such an extent, that I have avoided cutting timber during that period.

Prof. ATWATER. I have noticed some French experiments upon that point, and I will inquire if Prof. Brewer can give the results recently published? As far as I remember, the results were that timber cut in the winter months, in January, and perhaps as early as December and as late as February, was found to be much more desirable for posts as well as for building material, than that cut during the summer.

Mr. MITCHELL. Does Prof. Atwater refer to experiments in Prussia?

Prof. ATWATER. In France.

Mr. MITCHELL. There has been recently a series of experiments in Prussia, to which I have seen allusions occasionally generally bearing in the same direction, and confirming my experience in regard to fall cutting. They, of course, have no frosts there to interfere with the evaporation of the sap.

Prof. BREWER. I may say that I have made some inquiries on that subject, which have been very unsatisfactory. I have noted a good many newspaper statements, not always reliable, but generally narrating somebody's experience, and the general testimony has been, to confirm the statement of Mr. Mitchell, that late summer is the best time for durability. But there are certain regions where I have frequently seen it stated that the timber was most durable for posts (I am not talking about any other consideration), when cut when the tree was in full leaf, after most of the wood of the season had been formed. The experiments which I have seen have not been uniform, and I do not know, of course, which are the most reliable.

In regard to the matter of setting posts top downwards, some persons say they do not believe that they will last one hour longer than if set the other way; they do not see why they should. I have never heard it claimed that a post would last longer set butt end downward, by any one who has ever tried the experiment. There is a large amount of testimony from persons who have tried the experiment going to show that there is a difference in favor of setting top downward. I cannot now refer to the place, but I have seen a case stated like this: where a man set a fence in which one half of each post was set with the butt end down and the other half with the little end down, alternately, and at the time when the posts which were set butt end down were rotted off, those that were set the little end down still held the fence. This statement was published some years ago, in one of the journals that I have seen. I have observed a good many statements that posts would last longer when set top downward. I have no reason to give, but simply the fact.

Mr. **Goodman.** There is one question that I would like to ask Mr. Mitchell, but probably he will not want to answer it: whether he could map out a garden of proper size to supply the wants of an ordinary farmer's family? In my observation, I have generally found,—take the asparagus bed for instance, as an illustration of the rest of the garden,—that it was about the size of an ordinary door-mat. Assuming that the other vegetables of the garden occupy the same amount of space, it would follow that the people who raise vegetables, eat very little of them. I know that up in the region where I live, where we have a great many summer visitors, the people who take care of them, assuming that they prefer city vegetables, almost always have their vegetables brought up from New York. I do not know whether that is the custom in Litchfield county or not. I have no doubt that the people who come from the cities, expecting to live in the country in summer, would very much prefer vegetables raised on the spot, than to have the same vegetables to which they are accustomed at home.

Now Mr. Mitchell's remarks in regard to gardening on the farm are worthy of careful consideration. In the first place, the garden is often put in a place almost inaccessible. In the next place, it is so arranged that the farmer does not like to work in it. All that is entirely wrong. The garden should be so made that a plow can be run in it at all seasons. I have had mine so for years. If arranged in that way, you do not have to use the spade; and if there is anything that a Yankee dislikes, it is a spade. Therefore, if you want to raise vegetables, you must have a garden large enough to put a plow and horse in, and plow it up; and then if the garden is laid out in rows, you can very easily manage them. A quarter of an hour's work every day will give you all the vegetables you want.

I merely rose to add a little force to the suggestion of Mr. Mitchell. I think the farmers of New England do not depend enough on their gardens, for the reason that they do not take the plainest and simplest mode of having those gardens made, so as to raise their vegetables without much trouble, and give their families the benefit of them.

Mr. HYDE, of Lee, Mass. I do not profess to be much of a horticulturist, but for many years, I have cultivated my garden in the manner which Mr. Mitchell recommends. When I came into possession of my homestead, inherited from my father, I had a little garden on the west side of my house, fenced in, and very much resembling the one so aptly described by Mr. Mitchell to-night. His description brought vividly back to my mind's eye that old garden, with its wild artichokes, and its monstrous crop of weeds in the fall. I took down that old fence, and put my garden in a field, where I could cultivate it with a horse, and I found great profit in it. It is very easily cultivated. I have a garden of two acres and a half, perhaps, and I do not think it costs me much more than it cost my father to make his little garden of ten or twelve square rods.

I want to say one word on the fence question. I was delighted to hear Mr. Mitchell talk about abolishing all these fences. The first thing I did when I came into possession of my farm was to abolish all the interior fences in my mowing and cultivated lands; in the pastures, I have kept my fences up; and now I am talking about abolishing all my front fences. It took me a long while to get up to that idea, but the practice is coming into fashion with us in the western part of Massachusetts, and a great many persons are abolishing their front fences. Cyrus W. Field, who has taken a great fancy to our county, and to Williamstown in particular, at the last commencement of Williams College, promised to give the town of Williamstown ten thousand dollars, on some conditions; and one of the conditions was, that the inhabitants would pledge themselves to abolish their front fences. I was up there one day this fall, and I was delighted to see those front fences removed. The town was improved a hundred per cent. in appearance by the removal of those fences. There is no danger of damage by cattle, because we have a stringent law against cattle in our state. They are not allowed to roam in the roads, and the selectmen enforce the law, I am happy to say.

Mr. Fitz. In regard to the question whether or not it is better, in setting posts, to set the butts in the earth, we know that in the living tree, the channels through which the sap flows are so formed that it flows upward into the tree, and comes back between the bark and the wood; and the channels are so formed, it may be, that the sap cannot flow backward; so that when a post is set with the butt down, those channels act as tubes through which the water flows up, which keeps the post moist, while if the other end is set down, those same channels act as channels to carry the water off and keep the post dry. Moisture in the post is one great cause of decay.

Mr. Wells. A few years since, a bill was introduced into the legislature of Connecticut, drawn by Judge Shipman, relieving the proprietors of land from the necessity of building fences. It was advocated by representatives from the cities and villages, but not a farmer in the house voted for it. The farmers invariably voted in opposition to it.

Adjourned to Friday morning, at ten o'clock.

THIRD DAY.

The Board met at ten o'clock, Vice-President **Hyde** in the chair.

The report of the committee on Agricultural Experiment Stations, appointed at the last winter meeting of the Board, was read by the secretary of the committee, Mr. J. B. **Olcott**, as follows:

To the Connecticut Board of Agriculture:

In the second year of its work for securing an Experiment Station, your committee were glad to find a prevalent intelligence upon the subject. They had grown to believe in the good of it for themselves, and our farming people had become familiar with the idea of such an institution, its objects and aims. The labors of the preceding year had ripened into a favorable public opinion.

At the several conventions of farmers with the Board of Agriculture, the theory of an Experiment Station was discussed and explained, and our newspapers gave liberal assistance, as heretofore, in laying its plans before the public. Sundry publications of the Board of Agriculture were great helps, notably a tract, containing an account of the Agricultural Experiment Stations in Europe, by Prof. Samuel W. Johnson.

When the time came to circulate petitions, it was easy to get signatures. The minds of our leading farmers and citizens were ready for a practical trial of science as a means of agricultural progress.

We received an early hearing from the Committee of Agriculture, and advocated our original bill for an Experiment Station, as laid over from the preceding Legislature. Farmers from various parts of the State joined us in urging the need and use of such an institution, and were ably assisted by our State Secretary and gentlemen of the Board. At a second and third hearing kindly granted us, Dr. W. O. Atwater's long familiarity with Experiment Stations abroad, and Mr. Orange Judd's determination to realize a Station at home, were added to the strength of the good cause. In due season a Joint Resolution was reported by the Committee on Agriculture, and adopted by the Legislature, giving $2,800 per annum, for two years, towards establishing an Experiment Station in charge of the Trustees of Wesleyan University, Middletown.

J. B. OLCOTT, *Secretary of Committee.*

MR. GOLD. You have heard the report of this committee. At the last session of the Legislature, an appropriation of $2,800 a year, for two years, was made to the Trustees of Middletown University, to be devoted to this work, and Orange Judd, Esq., pledged one thousand dollars in addition to this sum. The Trustees of that institution invited the Board of Agriculture to meet with them in conference to decide upon the best plan of work that could be devised for the purpose of carrying out the objects of this appropriation. This committee met with the Trustees of that University, and spent a day in discussing the plans of work, the form of organization, and the advantages possessed by that institution which it was able to offer in the prosecution of the business. You understand that they offer the free use of their laboratories, in a large building, amply provided with all the chemical arrangements necessary for the work. As the result of this conference, an advisory committee was appointed, consisting of gentlemen connected with the Board of Agriculture and outside of the Board also, farmers in the State, whose business shall be to assist in devising plans for the working of the institution. So that, while the money is placed in charge of the Trustees of the Wesleyan University, and it rests finally with them to say how it shall be expended, it rests with the farmers of the State, very much, through this advisory committee that has been appointed of their own number, to advise with this Board of Trustees, with regard to the working of the institution, and the expenditure of the funds. They do not propose to shut it up as a close corporation, and to take that money and expend it just as they please, without listening to your wishes and your wants in that direction; but they invite and solicit your aid, to enable them to develop the full working capacity of the station. That is the position in which it stands to-day before the people of this State, as having some means at their control, for the judicious expenditure of which they are in part responsible. That is, while the Trustees of the institution are responsible for the judicious application of those funds, and the people will hold them strictly to account for that, yet they solicit of the farmers of the State such advice as they are able to render; and through this advisory committee you have an opportunity to present your claims especially upon that institution. In all parts of the State, wherever the subject has been presented, the feeling is very prevalent that chemistry, in its modern developments, the knowledge of methods of accurate scientific investigation, ought to be brought to the investigation of the principles of agriculture, and that now is the time when it is needed, in this transition stage of our agriculture, when men are looking about and asking, "Why is this?" "What is the cause of this trouble, and of the other?" and you find the farmers, each upon his own farm and upon his own territory, able to answer from his individual experience, but not able to give general principles, founded upon the laws of science, that shall prove true everywhere. We want an institution that is able to gather up these experiences, and to establish upon the sure principles of science, those matters in agriculture which we have been so long endeavoring to ascertain; and we have high hopes that this institution, well equipped as it is, and with its work well planned and mapped out by the farmers of the State, will result in great good to our agriculture.

Prof. Atwater will explain to you the particular plans of work which have been undertaken, which are now in progress; the facilities of the institution for this work, and the part which belongs to him to do, and I now leave it in the hands of the convention.

Mr. SEDGWICK. I wish to ask the chairman if the purpose of this Experiment Station is the analysis of commercial fertilizers alone. There seems to be an impression here that it is for that purpose only.

The CHAIRMAN. The chair does not so understand it.

Mr. West moved the acceptance of the report of the committee, and the motion was carried, without dissent.

THE AGRICULTURAL EXPERIMENT STATION.

BY PROF. W. O. ATWATER.

Mr. President, and Gentlemen of the Convention:

It is with a very great degree of embarrassment that I come before you now to explain to you about the organization, and the present and prospective work of the Experiment Station; an embarrassment which is due to various causes. In the first place, there is a feeling that the Experiment Station is not being started on so large a scale as we had cherished the hope that it might be; and secondly, it is not under the immediate directorship of that man, who, of all men in the United States, because of his reputation, because of his knowledge and capability for conducting such work, and because of the respect and more than respect, that we all have for him, is best fitted for its management. But the case is, as it is, and therefore as the representative, perhaps, of the institution, I will attempt to answer the questions that have been asked.

First and foremost, however, the question was squarely put, "Is the analysis of fertilizers to be the only work of this Experiment Station?" Gentlemen, that is not to be the only work of the Experiment Station. We hope to do much more than that. Then, what is it we are going to do? How are we going to do it? and what are the means we have to do with? You have been told that the State legislature has made an appropriation of $2,800 per annum, for two years, to be put into the hands of the Trustees of the Wesleyan University. To that, an addition has been promised of one thousand dollars, by one of the Trustees of that institution, Mr. Judd, who has likewise made a donation to the institution, of the building in which is situated the chemical laboratory, to be devoted to the purposes of the Station. The Trustees find themselves in a condition to offer to the Experiment Station the use of ample room in the laboratory, of apparatus and chemicals such as they have in store, and also the services of the Professor of Chemistry there, myself, and arrangements have been made by which part of the labor which has devolved upon me in connection with the department of chemistry, is to be otherwise provided for, so that I may have more time to devote to the management of the Experiment Station. In this way we shall be able to devote the whole sum appropriated by the State to the employment of competent chemists. We have now two men at work with us, and we are in communication with some of the Experiment Stations in Germany, in the hope of being able to import a chemist direct from there. The plans made by the Trustees contemplate the regular employment of three chemists, besides myself, for the work.

What, then, have we been doing, and what do we propose to do? The work may perhaps divide itself into three or four different branches. First, the analysis of fertilizers, and the establishment of a system for the control of the trade in fertilizers, or at least an attempt in that direction. Second, the examination of fodder materials, and, in general, the investigation of the nature and uses of the different materials employed in the feeding of cattle, their values, and the various ways of using them. We have special advantages in this respect, inasmuch as we have the results of a great many years of very costly experiments with cattle in the Experiment Stations in Europe, which results may be readily adapted to our own use, with some little work that we can do here. We think, therefore, that we may, by appropriating the results of the labors in Germany, which have cost years of time and thousands of dollars in money, make them useful in some degree at least to our farmers here.

The third feature of the work of the Experiment Station, and the one in which, as scientific men, we shall take the most delight, will be the abstract researches which we hope to make in agricultural chemistry. We have our plans, which this is not the proper place, perhaps, to unfold. And, finally, we wish to place ourselves in communication with the farmers of the State, by whatever means we may, in order that we may obtain from them a knowledge of what they want done, and be able to impart to them a knowledge of what we are doing. In this connection, we ask you to advise us how it shall be accomplished.

Prof. **Atwater** then proceeded more in detail to discuss the various points he had presented—but as it is designed to publish in this volume a report of the Experiment Station, these remarks are here omitted.

At this point, Vice-President **Hyde** left the chair, and Mr. G. A. **Penniman**, of North Woodstock, was called upon to preside.

Prof. **Brewer.** I would like to add a word or two to what Prof. **Atwater** has said. I wish merely to say, that this Experiment Station not only wants the sympathies of the public, but wants their confidence. The way in which these experiments are to be performed, and the best methods of doing the work, should be left to the persons in charge. We may get it into our heads that we could run the thing a little better than they can, but the probabilities are, that the men who give it their study, and thought, will do this work in a better way than we can suggest. I dare say, suggestions will be most gratefully received, but what I want to impress upon farmers, is, that the managers of the institution should not be hampered in any way in the investigations. They are responsible for the performance of certain duties, but we cannot hold them responsible, if we will not let them do their work in their own way. It seems to me, that is very important, and I wished to say that. You must recollect also, that there are various things that we have not entirely learned. I do not think we fully appreciate the importance of this matter of commercial fertilizers. I once knew some men who were very much interested in the manufacture of patent medicines, which, next to the manufacture of commercial fertilizers, is supposed to be the most profitable business there is; and one of the men said to the other, "The first point is, to put up the medicine in big bottles. The men who buy patent medicines want a good deal for their money. If you put it up in little bottles, and charge twenty-five or fifty cents a bottle, they think they are not going to be cured. But if you put it up in big bottles, and charge a dollar a bottle, they will think they are getting the worth of their money. The big bottle costs three cents, and the little bottle two cents; molasses is cheap, and there are various things we can put in to make it sweet, and to preserve it. The great thing is, to put it up in big bottles, plenty of it. Your agent goes around and says, 'Here is a great bottle; holds a pint; warranted to cure. If the first bottle don't effect a cure, try another, and make sure of it.'" I suppose you all know that the great change which has taken place in medicine, of late years, is in the substitution of the chemical principle at the bottom of the various vegetable drugs that we use in large quantities. In the days when these old men here were young, if any body had a fever, and his friends wanted to give him the principle of quinine, (they did not have quinine in those days,) they bought a package of Peruvian bark, which was broken up, and steeped in water, in a pail or big basin, alongside of the fire. It was of various degrees of strength, according to the relative amount of bark, and the amount of water. The direction given by the doctors, as a general thing, was, "about so much bark to about a pint of water, and if you don't get the full strength of the bark, by the first steeping, pour on more water, and abstract it again." Now, they do not give medicines in that way. It was not the whole of the bark which produced the result desired; it was a certain chemical principle in it. To-day, quinine is extracted in large quantities, from Peruvian bark, by chemists who make it their business, and that is administered by physicians. Its action is more certain, because it is pure, and because they know just how much they are giving; and the man who buys quinine knows that he buys just what he wants.

The same principle applies in manures. The rotten wood, sand, and coal which are contained in the sample which Prof. ATWATER has exhibited, are not the things which you care about buying. When I hear A, B, and C, say, "We can get that fertilizer for thirty-five dollars a ton, and they charge fifty-five or sixty-five for something else, and we don't believe it is much better, after all," I ask myself if the feeling of the old days is not still lingering among us, when we wanted big bottles of medicine, and took down whole tumblers full at a time, thinking we were getting the worth of our money. If commercial fertilizers are good for anything, they are good, because they contain certain ingredients, the value of which has been determined by science, and we ought to know something about how much we pay for them; and I do not believe that the farmers will ever be satisfactorily dealt with,—I will not say, *honestly*, because I cannot accuse the dealers in commercial fertilizers of being dishonest, under the present system,—but they will not be satisfactorily dealt with until some such practice is adopted as that which Prof. Atwater has suggested. I think the quicker the farmers of this State get it into their heads that they should buy a fertilizer, not because it is a ton, but because that ton contains a certain amount of phosphoric acid and nitrogen, and that they pay for the nitrogen, and phosphoric acid, and then it is a question of taste, how much sand and ashes and coal dust and muck is thrown in,—I say, the sooner farmers get that idea into their heads, the better it will be for them.

Mr. HUBBARD. I feel myself more solicitude in regard to this communication, that the Station may establish, or which it needs to establish with the farmers of the State, than I do in regard to any other point in its management, or any other condition of its success; and from the fact that my residence is in the vicinity of it, and that I have fallen into the habit of going up there and bothering the managers somewhat for a little while, being invariably pleasantly received, and getting all the satisfaction that I was capable of receiving out of the visit, I may claim to know a little something more of it from personal observation, than most of those who are here. I have unshaken confidence in the ability of those who have the Station in their charge, to do their part of this work, as well as in their disposition. There is not a particle of doubt in my mind in regard to that. And in regard to their facilities, I may say that they have, through the liberality of the Trustees of the University, and of individuals, unusual advantages for doing this work. We were very much disappointed when we received that small pittance, but if we had obtained the entire amount we asked for, and had been placed where it was necessary to hire or build laboratories, purchase materials, and pay for everything necessary to start such an institution, I do not believe it could have been started in anything like its present effective form. But it is necessary, not only that the work should be done there, but that the farmers should know of it, and should approve of it. It is necessary that this sympathetic union should be established between the farmers of the State, and this institution; and I could have wished that Prof. Atwater, if he had been prepared to do so, might have been a little more particular in his suggestions as to the manner in which that should be done. It has been a matter of some consultation, and probably the methods are not fully determined upon. It has been suggested that the newspaper press of the State should be depended upon, as a means of communication between the Station and the farmers. Undoubtedly, it may be so used, to some extent; the results of the investigations at the Station will be transmitted to the press, and the press will, no doubt, distribute them abroad, among the people. But, after all, I cannot think that that means of communication will be sufficient. I have myself urged upon the management of the Station that they should, if possible, print monthly, or bi-monthly, according as they got material to fill it, a little bulletin, or circular, and distribute it. I do not know that the means at the command of the Station will enable them to print and circulate such a publication gratuitously, but if not, I am quite sure that among our intelligent, progressive, and interested farmers, there are plenty who would be willing to pay a small amount for a periodical devoted exclusively to a record of the work of this Station, because it would be in a form in which it could be preserved. The different issues could be kept together, and at the close of the year, bound or rudely stitched together, and kept for reference. For, mind you, this material is not such as comes to us in the daily papers, which we glance over hastily, and then throw aside, to be used as waste paper. The work of this institution is of permanent value, and I think every farmer who wants to avail himself of that work, in the operations of his farm, will find it very desirable to have these publications preserved and laid aside for frequent reference. What is done this year is not something that will be of no use next year, but the record should be kept for reference whenever occasion requires. I hope that the Station may see its way clear to some such form of publication as I have suggested. I hope that persons in every section of the State, who are interested in progressive and scientific agriculture, will take it upon themselves, not only, if necessary, to subscribe, and pay for it themselves, but become agents to secure subscriptions in their neighborhoods, and see to it that every man who can be interested in this matter is aroused to its importance. I am inclined to urge it upon farmers everywhere throughout the State, and urge it upon the directors of the Station, that they try this means of communication.

Prof. Brewer. It is my private opinion,—to be sure, my opinion is not worth a great deal,—that there will be no trouble in getting this information disseminated. I think if the Station undertakes to publish a newspaper, it will have something else upon its hands besides its present work, unless somebody will guarantee the funds. There must be some way to supply the funds for such a publication. The probabilities are that they will not have anything to publish regularly. They cannot send out a circular as often as once a month. I have no fears that the information, after it has been carefully collected, and put into good shape, cannot be widely circulated to such as are anxious to get it. I however think, that the publication of a periodical, of any kind, will cost money. The publication of bulletins will cost considerable money; but if there are any benevolent people who wish to benefit the farmers, who will give money to have the information gathered by the Station, published in bulletin form, it would be desirable. I would not, however, consent to hamper the Experiment Station with any such plan.

Mr. Hubbard. Do I understand Prof. Brewer that the dissemination of this matter, in the newspapers, would be sufficient?

Prof. Brewer. I think so. It could be given to the agricultural papers, and a large portion of it, of course, will be disseminated through their reports. I think that persons who do not read newspapers will not be very apt to read bulletins. That is my impression. I may not have thought quite as much upon this subject as Mr. Hubbard has, but I know that various attempts to start private newspapers have proved expensive operations. Personal experience has taught me caution. It is very certain that the State would not appropriate money for that purpose. If the University wants to publish the results of the Station in that way, there is no objection; but I think that if any man should run around and try to get subscriptions to the amount of a thousand dollars,—and surely a thousand dollars would be a very small sum, I think his enthusiasm would be very much cooled before he got the money.

Mr. Augur. Prof. Brewer has hinted at an idea which I had in my mind, which is this; that for permanent preservation, a summary of all their work could be easily prepared for the Annual Report, which would be in very convenient form for that purpose. I entirely agree with Prof. Brewer in regard to this matter.

In reference to another point which has been hinted at here, that is, the importance of the farmers of Connecticut placing themselves in close sympathy with this Experiment Station, I would say, that the Farmers' Club of Middlefield, last spring, in view of what had been done in the analysis of commercial fertilizers, passed a resolution similar to this: That we would patronize no manufacturer, or dealer, who was not willing to put his wares fully under the control of such an institution; and in correspondence with two or three manufacturers, they agreed, in writing, that all the fertilizers they sold to us, should come up to the prescribed standard; if not, they would be responsible for them. The result was, that we never realized such satisfactory results from the use of these fertilizers, as we did this past season. I have not heard a word of complaint; and our farmers are universally feeling that they have had good success wherever they have made an application of fertilizers. I think we should all place ourselves in just this position, and that we should be willing to patronize those manufacturers and dealers who are selling an honest article, and let all others have a wide berth.

Prof. **Brewer.** I ought to have mentioned, that the analyses, published so many years ago, by Prof. Johnson, are in permanent form, and readily accessible. They are very widely published and commented upon.

Mr. **Eggleston.** It seems to me there will be no difficulty in getting the results of this Experiment Station through our ordinary papers. I have some acquaintance with some of them, and I know they will be only too glad to receive any thing that Prof. Atwater may send them, at his discretion, and lay it fully before the public. They will be very glad to get what it has been proposed to give them; and then, if, as has been suggested, these results, or a digest of them, should be published in the annual proceedings of this Board, it seems to me we should have the facts before us, as far as they can be set forth in print. But then, it is one thing to look at the figures, it is another thing to have Prof. Atwater explain them, and be questioned in connection with his explanation. Now, he has spoken of the desirability, both for the farmers and for himself, of having sympathy and personal communication. It is very pleasant for us to sit here to day, and listen to him, and to have these samples, which we can, at our leisure go and look at. Now, it has occured to me, while sitting here, that if, in addition to meeting this body, it could be arranged that Prof. Atwater, or some one in his place, representing this Experiment Station, could be present at all our local agricultural meetings, which occur in the autumn, mostly, and there, this thing be repeated, it would go before a much wider circle, it would satisfy the farmers, and forward the whole thing in a very perceptible way.

Mr. **Gold.** The gentleman perhaps is aware that the State Board of Agriculture, in its attempts to awaken an interest in this matter of an Agricultural Experiment Station, has held, for two years, a number of single day meetings, in various towns in the State, afternoon and evening, at which gentlemen competent to explain the objects of that work were present, and also others interested in some special department of agriculture, have presented those subjects to the farmers. Mr. Augur, our Pomologist, has often spoken in connection with our meetings, and I have also addressed the farmers on those occasions. Last evening the question came up before the Board of Agriculture, whether we should continue that system of lecturing somewhat the coming winter, and a committee of three were appointed, consisting of Prof. Atwater, as the Director of this Experiment Station, Mr. Augur, our Pomologist, and myself, who were authorized to arrange with Farmers' clubs, or any other similar associations in the State, for the delivery of lectures upon any agricultural topic the coming winter. We are prepared to undertake what we can in that line, to bring this institution, through its Director, or its other workers, and our Pomological department, to the attention of the farmers of the State. We are anxious to bring all these in close connection and sympathy, and to spread whatever knowledge we can gather up, directly among the farmers; and whenever any gentleman desires to have these subjects presented, and can assure us of accommodations, and sufficient interest to give us an audience, we are prepared to arrange for such a series of meetings, within reasonable limits, always regarding our ability to attend them.

Mr. EGGLESTON. I am aware of this arrangement, and it certainly is a very good and desirable one; but in addition, I think it would be well to have meetings that shall bring together a more miscellaneous collection of farmers than we find here. This is a representative lot of farmers. I think I could pick up a lot of farmers in Connecticut that would not look like this collection to-day, and it seems to me, that if we could reach that class of men who would never come to a meeting called for the purpose of bringing forward any scientific ideas or the results of scientific experiments, or anything of that character, and carry these facts to them incidentally, we might push the thing a little further. I therefore suggest it.

Mr. GOLD. The report on the Experimental Station has been accepted. I suppose it will be in order now, after the subject has been discussed, to move that the report be adopted. I make that motion. Carried.

DISCUSSION ON ROADS.

Mr. GOLD. *Mr. President and Gentlemen*:—The time allotted upon our programme for the discussion upon roads is so far exhausted that I will trespass but a short time upon your patience. My object at this time was to bring before you the matter of road statistics, as gathered by me through the inquiries I have made of the town clerks and other gentlemen interested in the subject of roads throughout the State. Some six weeks ago I issued a blank form to all the town clerks in the State, and also to other gentlemen interested, requesting an answer to various inquiries upon the subject of their highways. I have received returns from only forty-five towns, up to this date. The circulars were sent out with a return envelope, stamped, and it is expected that every gentleman will answer an invitation of that sort, and I have been disappointed at the small degree of interest manifested in this matter in the various towns. I expect and hope, however, to secure full returns from the State; and I ask your attention to it here, that those of you who live in different parts of the State from which returns have not been made, may see that they are speedily made to me, as I desire to tabulate the whole, and present a mass of information upon this subject such as I have not been able to find elsewhere. I will briefly call your attention to these inquiries, that you may see how much ground they cover.

1. What is the length of road in the town of ——— ?

Some of the gentlemen who have answered, did not put in the name of the town, did not even sign their own names; and there was no way to ascertain the name of the town except by the not always very plain postmark that was on the envelope, or the name of a bridge or river that they sometimes put in their answers. It requires a thorough study of the geography of the State even to locate these forty-five returns.

2. What is the annual cost of keeping it in repair?

3. What is the cost per mile?
4. What is the annual expense for bridges, if separate from the roads?
5. What large bridges do you support?
6. What is their length?
7. Of what material constructed?
8. What was the cost of those bridges?
9. Are any supported by tolls?
10. How are the roads repaired—by districts, contract, or otherwise?
11. What is the character of the soil in the town?
12. Is the surface generally hilly or level?
13. What materials are used in repairing the roads?
14. What materials or means have been used in road-making or repairing, in very bad places?
15. What is the width of the path of travel?
16. What is the width between the wheel-tracks?
17. What is the width of highway?
18. What special tools or means are used in repairing roads?
19. Are there any turnpikes in town upon which toll-gates are maintained, and what is their length?
20. Are your roads improving or deteriorating in condition?
21. Are cattle allowed to run on the highways?
22. If not, are street fences still maintained?
23. What means are taken by land-owners to utilize the land upon highways adjoining their premises?
24. To what extent are fruit or shade trees planted by the roadsides?
25. General remarks upon constructing and repairing roads.

Now, as I have said, my returns from these circulars embrace some forty-five towns, and I have made a summary of some of the results, and from these made my deductions with regard to the whole State. Forty-five towns make an average of seventy-eight miles of highway per town. The total length of highways in those forty-five towns is 3,500 miles, in round numbers, at a total cost of $102,000 per annum. The average cost is about $30.00 per mile. The average cost per town is $2,269. The average width of the highways in the towns is three rods. Now, 3,536 miles gives us 21,215 aeres of land, occupied by highways, in those forty-five towns, or an average of 471 acres per town of highway; and we have, for the 167 towns in the State, carried out upon the same basis, (although I think those are hardly as large towns as the average; the smaller towns have been a little more prompt in their answers than the larger ones,) 13,000 miles of road, costing about $390,000, and occupying 78,000 acres of land. This is irrespective of the cost of the large bridges, which in some towns almost equals the cost of their highways. The burden that some towns are called upon to bear in the matter of bridges as well as highways is very heavy. In regard to the annual cost of keeping these roads in repair, there is to be a little allowance made, because the returns from some of the towns include the expense of new roads built during the year, and others do not.

Now, what is the general impression derived from looking over these statistics? It is, that we have too many roads in the State; that our roads are not as good as they ought to be; that they are not as good as we are entitled to have from the amount of money expended. I think that when I have placed these statistics before the people of the State, so that they can study them, and see how differently towns expend money upon their highways, we may hope that much good may result. I solicit therefore your earnest assistance in securing full returns.

I have not calculated the cost of these roads in proportion to the grand list of the State, but there is one very curious fact that I have observed, to wit: that in very good degree, the cost of the roads bears a uniform relation to the population of the towns. In our rural towns, farming towns, with a sparse population, the cost per mile is greater *per capita* than it is in our manufacturing towns,—considerably more. It approximates in our rural towns very nearly to one dollar per head on the inhabitants of the towns; in a few it reaches two dollars per head.

I propose not to take up much time on this matter myself, but to open the subject for inquiry and discussion.

Mr. **Eggleston**. Is the Secretary able to give us, from the statistics which he has received, one or two instances of towns where the roads are approximately what they should be?

Mr. **Gold**. One of the best things I have here, I think, is a form of road contract, from the town of Hampton, which contains some very valuable suggestions upon the subject. After describing the roads, it says: "Said roads are to be repaired as follows: whenever it becomes necessary to round a piece of road, it shall be done in such a manner that the center of the road shall be from fifteen to eighteen inches higher than the ditches, and shall gradually slope each way, so that the water will run towards the ditch; the stones to be removed and the dirt to be levelled in a good, thorough, workmanlike manner. It shall be deemed necessary to round the road when it is so much lower than the shoulders that the water runs in the middle of it. The main road, where practicable, to be not less than twenty feet wide from ditch to ditch, and cross-roads not less than fifteen feet. All rocks and boulders which are in the way of wheels are to be removed. The bushes are to be cut each year as far back as the back side of the ditches, and further back, where they incline toward the road in such a manner as to be in the way of travel. Water courses are at all times to be kept open. New stone bridges are to be built, and old ones cleared out and rebuilt whenever and wherever it is necessary for the safety of the road. In the months of November, April, June, and September of each year, all small stones shall be cleared out of the roads. The roads are at all times to be kept in good traveling condition, and two-thirds of the yearly labor is to be performed previous to the first day of July in each year. If any part of the road is neglected so that it is not satisfactory to the Commissioners, they will give said contractor five days' notice of such neglect, and if not repaired in that time, said Commissioners will order some one else to do it, and deduct the expense from the yearly pay of said contractor." That seems to be a well arranged contract.

QUESTION. What is the expense to that town by the mile, sir?

Mr. GOLD. Twenty dollars per mile.

Mr. CARRINGTON. Will the Secretary give us the full return from that town, in answer to his inquiries?

Mr. GOLD. I do not find that readily, and I will give you some other town. Here is Middlefield. Middlefield has only thirty-six miles of road. The annual cost of keeping the roads in repair is put down as $1031.29. "Cost per mile, $30.00. Annual expense for bridges, separate from roads, $356.67. They report four and one-half large bridges, about fifty feet in length, constructed of wood. Those bridges cost about $7,000; not supported by toll. The roads are supported and maintained by districts, under charge of a road-master. The soil is heavy loam. Surface generally hilly. Earth is mostly used for repairing roads; in very bad places, stones, covered with earth, are used for filling. The width of the path for travel is from sixteen to twenty-five feet. Special tools,—iron and wood scrapers." Many of the towns, where the roads are in the most perfect order, report that they use a machine specially made for the purpose of scraping. In Middlefield, they consider that their roads are improving. Cattle are allowed to run upon the highways, somewhat; not so much as formerly. Street fences are still maintained. In some sections, the land-owners utilize the highways by mowing the grass, and more or less ornamental trees are planted every year. "We need better drainage, fewer bars, and easier grades," is the report from Middlefield.

Mr. CLARK. I wish the Secretary would state what method is usually adopted in those towns for repairing roads, and what he considers, from the result of his investigation, is the best method for a town, economically considered.

Mr. GOLD. I have not tabulated the facts any further than I have stated. These reports have come into my hands, some of them, within the last two or three days, and therefore I have not attempted it. The reports from the different towns, if you take them up one after the other, are almost as diverse as you could conceive in the expression of opinions. Some are going into the contract system, with high hopes of success, and others are just abandoning it and taking up some other method. I am unable to draw any conclusion from the returns as yet on that point. I hope to present the whole in tabular form, as far as it can be tabulated, in my report, and present it then as a subject for study.

There is one point to which I desire to call your attention, which, after the discussion yesterday, seemed to be left a little loose in the minds of the members of the Convention. It is the law in regard to street fences and highways. The law in regard to cattle appears to be this:

"Any person may take into his custody any animal at large in any public highway and opposite to land owned or occupied by him; and any animal trespassing upon premises owned or occupied by him, and which entered from the highway, or through a fence belonging to the owner of said animal, or a sufficient fence belonging to any other person; but he shall, if the owner of the animal be known, give immediate notice thereof to him, and may demand of him, for every horse, mule, ass, ox, cow or calf, twenty-five cents, and for every sheep, goat, goose, or swine, ten cents, together with just damages for injuries occasioned by such animal; and when such payment shall have been made, if demanded, the owner shall be entitled to the possession of his animal, if applied for within twenty-four hours after such notice shall have been given." Revised Statutes, p. 256.

Mr. Clark. This question of roads is a very important one: it has relations bearing on all classes of the community alike; but why an Agricultural Convention should specially devote its attention to this question is not apparent. I have no doubt the Secretary has positive aims in view, and can explain to us what he hopes to attain by these inquiries, and the Convention, I have no doubt, would be obliged to the Secretary, if he will set forth, in few words, specifically, what he hopes to accomplish by these inquiries, and by turning the attention of the Convention to the subject.

Mr. Gold. In my opening remarks I went over that ground very briefly. I stated that I believed that the farmers were not only generally the road-makers of the State, but they were in a very large degree the road users, and in addition to that, they had to bear almost the whole burden of the cost of using them by all classes of the community. That is the point. It is just here; take any of the rural districts; we used to live, every man in the center, with his blacksmith on one side of him, and his shoemaker and carpenter on the other, the doctor, perhaps, on the hill-side, and the tanner in another neighborhood, all taking pay for their services in our products, and we were just as near everybody as we could be located. But times have changed. Now, all business, professional and mechanical, seeks the railroad centers, and the farm alone lies upon the hill or in the valley, where it has always been, and where it must necessarily be. Well, now we have to pay, not only the cost of transporting our produce to the village, but we have to pay the cost of the travel of the professional man and of the mechanic who visits us for any purpose of business, trade, or anything of that sort. The farmer has to bear all that burden. Now, if we can make shorter, more direct, and better roads, roads of easier grade, upon which the professional man can travel with less wear of his horse and vehicle, and less expenditure of time, that will, in the end, all be saved to the farming community; but at present it is a grievous burden. That is the true state of the case, and that is why I consider it so imperatively resting upon the farmers to see to it that this matter of roads receives attention. I know it is common to refer it to the doctor, as a man who rides a great deal over the roads, and therefore most interested, and to some other professional men, or to men engaged in mechanical employments, that call upon them to travel; but when you get down to the bottom of it, the farmer pays the cost of the whole, just as surely as he feeds the whole community with the produce of his fields.

Mr. West. I think I can readily see why the farmer is particularly interested in the roads. Many of us live from three to four miles from anywhere, and consequently we have to use the roads more than any other class of people. Situated as I am, I have to go nearly three miles to the post-office, and a mile to meeting. My teams run from two to three times a day throughout the year, going from my farm to the center. Consequently, the farmers are the users of the road, and in most places, as has been well said, they are the builders of the roads, and it is very proper that we should discuss this question of how these roads should be built. We had a very good lecture upon this subject, but it is beyond the reach of these poor rural towns to build macadamized roads; what we want to know is, how we can improve our roads with the material we have at hand.

The great mistake in laying out and building our roads consists in building the surface of the road without sufficient regard to the grading. Taking off the top of a hill two or three feet, and building it up at the bottom, the same amount reduces that elevation very much; but when these roads are built, we find that they are built upon the surface. I have had experience in that matter. Situated as I was, I wanted a road to get to the depot, at Hop River. I had to fight the town for two or three years, to get a road. I got an engineer to show to a committee from the Court, how that road should be built, and what advantages would result from it. When the road was built, it was built in such a manner that we did not derive the advantages that were set forth before that court. In going up an elevation, they have left swells, so that in going up the hill, you rise and fall again unnecessarily. There are two or three such places, which, at very little expense,—it would not have cost, probably, more than five or ten dollars,—could have been graded down to a regular grade. There is the difficulty. The Commissioners, or the Selectmen, will accept a road, paying no regard to this matter. A road is bid off and built in the cheapest manner,—the earth simply rolled upon the surface, without any regard to the grade. Then in regard to the material, they go into a muck swamp, and haul it out and make the road. You will find a great many such roads. A great many people, when repairing roads, will haul on turf, when they should go down to the subsoil and get gravel. A few loads of gravel, and a few loads of stone, put into a muck hole,—instead of putting in grass and muck and bogs, as is too frequently done,—and then covering that with good substantial material, will make a passable road, and one which will last a long time.

Mr. HUBBARD. I would like to give a little item of personal experience, in illustration of the Secretary's position in regard to roads. I live three miles from the city of Middletown. I wanted a job of joiner work done in repairing a building; nobody anywhere around me could do that work, and I had to go to the center, to a large builder, to procure the necessary help. He consented to let me have two men to do the work, but it was necessary for me to take my team and go to his shop, three miles off, and be there at seven o'clock in the morning. After a little while, the men would be ready to go with me to my house, and there they would work until about five o'clock, and then I had to carry them back. I not only had to transport them, but I had to pay them for the time I was taking them to ride. I suppose that is not an exceptional case, but it is the ordinary rule, when mechanics are procured to do work away from the center.

Mr. WADHAMS. I am always disposed to give even the devil his due. I am aware that the modesty of these professional men, who are with us, will prevent their saying anything in their own behalf, and therefore I will say a word for them. The secretary has intimated that we farmers build all the roads, paid for them all, and were entitled to have our own way about them. I think that is a little stronger than it will do to put it. These professional men, ministers, lawyers, and doctors, if they have any pecuniary means,—and I think they generally manage to get about as much of the "root of all evil" as other people,—contribute their mite in this direction. I would therefore have the Secretary haul in a little, if he will, and not claim that we do it all. I say this in behalf of that modest class in our community, who will not assert their rights or venture to speak in public.

Mr. CLARK. The remark of the Secretary in regard to building these roads, struck me as entirely new. The idea that the farmers build these roads, and pay for them, is certainly a novel one to me. If the farmers in his town are the only ones who are put under contribution to build these roads, it is not so in the town of Winchester. The truth is, that instead of the farmers building all these roads, they do not contribute one quarter of the expense of the roads. I wish there were better roads for the farmers to use, but when it is put upon the ground that they are the only tax-payers, it will not quite bear the test; it is not true. Did the gentleman ever take into account that the railroads are taxed to make the roads? Every brick in his chimney, and every rail on his farm, is benefited by that railroad going through the town, being taxed as it is to keep up these highways. I only find fault with the proposition, that the farmers do it all. The farmers are our neighbors; they are our friends; we walk hand in hand; but we are not quite prepared to accept the proposition, that nobody contributes to the support of the roads of the State, but the farming population.

Mr. GOLD. A little explanation will have to be made to make myself clear upon that point. I did not mean to convey the idea that the roads were supported by the farmers because of the way in which the taxes were paid, but that such is the position of the farming community, relative to the villages and to our centers of business, that we do have to support the highways in the manner to which I referred. We have to pay the plumber for his travel over the highways from the village to our farms. If we can shorten the distance and the time required one-half, we do not have to pay him but half as much for his travel. If we can shorten the time required by the doctor to travel to our farms, and save the wear and tear of his horse and vehicle, in the end, we shall get his services at less cost. And so of every professional man, every mechanic, every trader with whom we have to deal, and in the transportation of our produce to market, it is the same. We have to pay the cost of transporting our products to the business centers; it is not the man who buys them that pays, because those things are raised by others in close proximity to those business centers. The farmer, therefore, who resides five miles away, has to transport his potatoes, his wood, and his other products, over that five miles of travel, and if the road can be made more passable in any shape, he is directly relieved from that tax, that burden which he bears. It is by the men on the farm that most of the earth is handled and the roads constructed, and it was in that sense I said they were the road-makers; they are the road users, because their business requires them to be often on the road between their farms and the village; and then, in the secondary way in which I stated it, they pay for the travel of the mechanic and the professional man, as Mr. Hubbard illustrated, from his personal experience. I did not mean to say that manufacturers, professional men, and traders were exempt from their share of the road tax. I do not wish to be so understood.

Mr. Wadhams. I presume you will all accept the Secretary's explanation. I thought, from his first statement, that were I a professional man, I should feel a little as if he were sticking pins into me, and it was for the purpose of having him modify his statement a little that I made the suggestion I did.

Mr. Carrington. The very learned gentleman who discoursed to us yesterday on the law in relation to roads, demonstrated one principle which he started with in his remarks. He said that a lawyer should be able to answer any question put to him relating to the common law; but in regard to matters relating to statute law, he should not be ashamed if he could not answer. In the course of his remarks, he stated to us, that if cattle entered upon our premises from the highway, where we had not an ordinary fence, or where we left our gates or bars open, habitually, we had no remedy at law for the damages which they might commit,—our only remedy was the poundage fees. That he stated as his opinion. As it is an erroneous one, and I think may have produced an unfavorable impression, it ought to be corrected, and if the Secretary will read the section which I pointed out to him, you will find that the statute provides, that if damages are committed by cattle which are running at large contrary to law, the owner of the premises has a remedy, even if he has no fence at all.

Mr. GOLD. In addition to the section which I read, I will read the one to which Mr. Carrington refers:

"No person shall receive for damages done in his enclosure through the insufficiency of his fences, unless done by animals at large, contrary to law, or by unruly cattle, that will not be restrained by ordinary fences; or unless the owner of the animals shall put them into, or otherwise voluntarily trespass on such enclosure; or unless they entered through a part of the fence which was sufficient; in which case, the owner of the land may impound them, and recover poundage and damages."

The point to which Mr. Carrington refers is covered by this clause: "unless done by animals at large, contrary to law."

Adjourned to 2 P. M.

AFTERNOON SESSION.

The Convention re-assembled at two o'clock, and in the absence of Vice-President HYDE, Mr. N. HART took the chair.

FARMERS' HOMES, AND HOW TO USE THEM.

BY HON. RICHARD GOODMAN, LENOX, MASS.

When Signor Benedict said he would die a bachelor, he did not think he should live till he were married, and build or buy a house and help people the world. But the mocking bewitchery of Beatrice was too much for him, and after marking the thousand blushing apparitions which started in her face, he was fain to pop the question, and bear as best he could the gibes of his quondam companions.

When I listened to the persuasions of our friend Mr. Gold, and in a moment of weakness promised to prepare something for the meeting of this board, I had no idea that when the time arrived to execute my promise, my library would be turned into a butler's pantry, my books stand like ghosts shrouded in cerements of the grave, and pitiless confusion stare at me from every quarter! Upon this hint I spake and asked him to excuse me, but he replied that the programmes were out, and so after fleeing away to enjoy a Thanksgiving in your state, I returned a few days since and am about to jot down some miscellaneous ideas on the topic assigned to me, trusting that your discussions will add substantial bread to the undue quantity of sack. We have all got familiar with the unfortunate wight, who, traveling the narrow and rocky road amid ravines and precipices, leading from Jerusalem to Jericho—now as formerly infested with robbers—fell into the hands of those gentlemen of the road and was stripped of his raiment and otherwise maltreated. But his case was a mild one compared to that which awaits the middle-aged conservative *pater familias* who listens to the syren song of wives and daughters, the persuasive tones of architects and the flattering promises of builders—promises which, like pie-crust, are made to be broken—and plunges into the vortex of adding to an old house and amending or trying to better its condition. He can then realize the import of those pregnant lines of Dante, in the Inferno:

"For of fortunes sharpe adversitie
The worst kind of infortune is this,—
A man that has been in prosperite
And it remember, when it passed is."

Perhaps twenty years ago I should have enjoyed it more, or rather not suffered so much, for as we grow older trifles light as air become weighty, we are more sensitive to any interference with established habits, and the head which could crack the ice with impunity in a skating bout at twenty would hardly rebound from the concussion at fifty.

It seemed a pleasant thing to build, on paper. I was familiar with the literature of house making from that which Jack built, in my earliest recollection, to the homes so delightfully described by Mr. Gardner, of Springfield, in his recent lucubrations. I had studied and written out for the benefit of the readers of the "Country Gentleman," the way the old Greeks and Romans lived, about the same time that the author of "My Farm of Edgewood," who has given us the valuable paper on farm fences, was preparing his incomparable "Wet Days at Edgewood," in which is concreted all the wisdom and beauty of the ancient writers, affecting rural pursuits; and I had perused with avidity the same author's "Rural Studies," and especially that portion of the volume devoted to "Mr. Urban and a Country House," where any one about to build will find a mine of good practical sense as well as direction how to get the sunshine into the house and make it look, if not be, *liveable.* Supplement this volume with Mr. Gardner's "Homes, and How to Make Them," and you possess all the necessary theories and practical hints on the methods of house-building, so as to unite the useful with the beautiful, and if you can obtain the services of an architect and builder who will sympathize with these directions, or can work them out yourself, you will be pretty certain to possess a home in which you and your family can not only be, but *live.*

I had even for a short period experienced those vicissitudes of delight and misery attendant upon the introduction and management of modern conveniences in a city residence so graphically described by Mr. Beecher in the first paper of "Eyes and Ears," and had been compelled to discard the "hot air gentleman in black" for open grates after the cook had tried to quench the heat from the bottomless pit of the former unavailingly with water. My family had suffered from the innumerable smells emanating from the street sewers up through the water-closets and bath-tubs in those days of imperfect plumbing, to which the stenches of Cologne immortalized by Coleridge, were but as shadow to a substance; from a deluge of water over carpets and furniture, from bursting frozen pipes, and a fall of central plaster ornamentation from the same cause on the dinner table, which made a sad commingling of eatables and broken crockery; from the gas declining to yield forth its light just as the company were assembling in the drawing-room, and a curt retort from the grocer on the corner that he didn't keep candles; but worse than all, from the want of good breathing and play room, the deprivation of the real *ozone*, only to be found in the rural districts, and of a daily sight of the rising and setting sun, phenomena which, as Emerson says of the stars, "if they should happen once in a thousand years would make men believe and adore and preserve, for many generations, the remembrance of the city of God, which had been shown." We were glad to exchange into the country into a good old-fashioned house, where nothing could get out of order, where seated immovably on a hill and defended from the blustering winds by one a little more elevated, it commands a prospect of land and water, mountains and lakes, woods and plain, where the luminaries of day and night are not obscured by surrounding houses and city smoke, and where we have lived in peace, not fearing bursting pipes, leaking gas, and have been able, without impinging too stiffly upon the purse, to indulge in the luxury of wood fires and a horse or two.

My house had but one fault, an association or intimate connection with a rear building, which, a century since, was the home of the then owner, and to which was subsequently added that which I occupy, and which rear building was our kitchen. It was probably moved up hurriedly from a lower locality, and had no cellar under it, and consequently showed signs of decay, became musty, damp, and dolorous to the imaginations of the female part of my household, and I saw it was doomed. But I put off the evil day not alone because it appeared much to have a kitchen built, but I judged it would spoil part of a summer and interfere with my farming, and perhaps with the quiet of my library. I had not then read Gail Hamilton's "Twelve Miles from a Lemon," in which she so vividly describes the cost and dimensions of a structure merely to get a bath-room, nor profited by the experience of some young relatives who, to get a nursery for a growing family, have built a house almost as large as the original to which it is an adjunct, and looking to the future of the nursery folk, have included an enlarged dining-room, studio and play room, not to mention an enhanced range in kitchen, sundry pantries, and additional heating apparatus, and a wilderness of cellar—all merely to have more nursery-room!

I had studied up my friend Warner's "Back-log Studies," and could repeat almost verbatim that sentence of the mistress, when she says, "men build most of the houses in what might be called the ready-made clothing style, and we have to do the best we can with them; and hard enough it is to make cheerful homes in most of them. You will see something different when the woman is constantly consulted on the plan of the house." In other words: There must be a divinity to shape our ends, rough hew them how we will, and arrange for the closets.

Now all my male hearers also know that this is true, though perhaps not ready to acknowledge it, for really the home is the temple erected in pursuance of the marriage-vow at the altar, and the wife is the priestess whose duty it is to keep the sacred fires constantly burning, and to prepare and superintend the three daily sacrifices to the appetites of the *dominus* or lord who is supposed to rule over her and her household, a somewhat violent supposition in these days. In the house of every Greek and Roman of ancient times was an altar, and on this altar there had always to be a small quantity of ashes, and a few lighted coals. It was a sacred obligation for the master of every house to keep the fire up night and day. Wo to the house when it was extinguished, for an extinguished hearth and an extinguished family were among those people synonymous expressions. This sacred fire was the Providence of the family, and the meals of the family became religious acts. The god who cooked the food manifested himself in the bright flame, and a prayer, therefore, was due at the beginning and end of the repast. The symbols of this religion became modified in the course of time, and when the people of Greece and Italy began to represent their gods as persons, and to give each a proper name, and a human form, the old worship of the hearth fire submitted to the common law which human intelligence in that period imposed upon every religion. The altar of the sacred fire was personified. They called it *Vesta*. By degrees a legend was formed. They pictured this divinity to themselves as wearing a female form, because the word used for altar was of the feminine gender. They even went so far as to represent this goddess in statues, and ever since the presiding genius of our homes, our sacred hearths, cook-stoves and ranges has been the mother of the family, but our puritan forefathers would have smiled derisively if any one had informed them as they sanctified their pork and potatoes, coffee and griddle-cakes, "cyder" and mince-pies by the usual benedictions that they were only following the earlier usages of the heathen.

Our sacred fires have been pretty well kept up, and the sacrifices must often have appeared unnecessarily frequent, and the incense smelled rather rank to heaven, but the principal party for whose benefit they are, having no part in the preparation is generally unaware of the "toil and trouble, bubble, bubble," which pervade the kitchen from

"Morn to noon, from noon to dewy eve,"

until from sickness on the part of his help-cook-meat, or other cause, he has to take a turn at the bellows, or firing up the stove, and preparing the food, when he realizes that however minute may appear the ramifications of woman's work, like the tiny cords of the Liliputians, which bound Gulliver securely, they will conquer man.

A witty woman commenting on Mormonism, exclaimed, "How absurd! Four or five wives for one man; when the fact is, each woman in these times ought to have four or five husbands, to support her decently!"

Another equally witty and truthful, said, "The fact is, a man does not know how to straighten up things. He does not know when to commence. I don't wonder that when God made Adam he went right to work and made a woman to tell him what to do!"

Recognizing these self-evident truths as applicable to house building, and especially to the kitchen part, I put into the hands of my female divinities* a plan made by an architect many years since, when we had contemplated a like alteration, and requested them to draw from it the ground and upper story plans for the modest kitchen that our time-honored and unobtrusive farm house required. This preparation began in the winter, and from time to time in the evenings diagrams were strewed about the table; many whispered conferences were had, and at last a neat little set of parallelograms showed themselves, which when explained by the inventors proved to be a plan of the kitchen, or rather numerous kitchens. There was the kitchen proper, and then the natural attendant, the laundry, and a milk-room and pantry, and as the building was to extend some ways north of the main house, why not utilize that space south, and have a new dining-room, and as a low roof would look bad over it, two new bed-rooms, and one over the laundry, and another over the milk-room, in addition to sleeping rooms of the domestics, bath-room, water-closets, &c., &c. Well, why not? Of course it would cost a little more, but not much, and then it would be so lovely! Of course! Then the plan was handed to a builder who had done some conscientious work for us, and he pronounced it just the thing; thought to build it would not exceed the sum we proposed to expend, and promised to take hold and have the work all finished by the first of August!

Spring broke, May passed, June was ushered in; no rain; just the weather for digging cellars; but, alas! our builder, who, unlike Pope's "statesman yet friend to truth who broke no promise," failed to come to time, postponed, until at last weary with delay, we put the plans into the hands of another builder, who, surveying the ground carefully, put his estimates a third higher than the first. This dismayed the feminine architects, so whilst they were deliberating I had a plan made by a regular architect, showing the outside effect and specifications, carefully prepared. These were submitted to a third builder, who, after some days, offered to do the work for a third more than the second. This was from Scylla to Charybdis, so we went back to Scylla, and putting the specifications in his hand, told him to go ahead; but after reading them over and consulting a day or two with his foreman, he found he could not do it for much less than Charybdis. Reason why—the professional architect had specified for the same kind of fancy wood-work put in town houses. So, sitting down with the builder, we cut off everything not in keeping with the simplicity of the old mansion, and he was able to reduce his estimates to the original mark, saving and bating extras which of course have sprung up like mushrooms.

By this time it was midsummer. July had come round, but promptly the contractor for the cellar came, and so did the rain; the deeper the digging the harder the rain; excavations nine to ten feet deep in a clay soil caved in, horses stuck in the tenacious mud, several hundred loads of this sticking material were deposited on the public road, which needed raising, but mingled with it are multitudes of curses both loud and deep, emanating from the coachmen with hyacinthian locks and elevated whips, who looked ruefully at their carriages and thought of the pleasing performance of ablution when the drive was over. If hard swearing will maca*dam* a road, that in front of my house will remain for many years superior to any road in the county. At the end of six weeks the cellar was stoned up and finished, and the carpenters took hold in earnest, and yet when the thermometer fell 12 below zero just after Thanksgiving, many of the doors and windows were paper, cracks let in the northwesters, and at this present writing confusion is worse confounded, and the household eat, live, read, and write in one room, and nearly all sleep together in another!

All this doesn't seem much in the telling, but try it on once and, as the boys say, you'll know how it is yourself.

"'Tis all men's office to speak patience
To those that wring under a load of sorrows;
But no man's virtue nor sufficiency
To be so moral when he shall endure
The like himself."

The first thing, of course, the carpenter did was to tear down the old kitchen, improvise another in the end of the wood-shed, from whence the meals were sent into the house, through the front door, the window, or a side door, as the artificers allowed or interfered; the lawn, which we were assured would not be disturbed, soon became a lumber yard and mortar bed; the whole force of the farm was required to remove the constantly accruing rubbish; the apples and potatoes froze in the barn for want of room in the cellar, which in its turn had become a receptacle for mortar on the approach of cold weather. The domestics climbed up and down ladders on retiring and rising; the cats walked mournfully from place to place, recognizing no familiar spot; the house dog wailed for his accustomed box by the kitchen fire at night; the family were arranged, for sleeping purposes, in the only two habitable rooms left up stairs, like the Shakers and Jews on Sunday—males on one side of the hall, females on the other, and thus have the divinities that preside over the domestic fires avenged their extinguishment, and it remains to be seen whether they will be appeased when re-kindled.

Happy the man who, compelled to build, has a clean sweep of ground before him, so that he can plan to the minutest item what he wants, can stand, and remain if necessary, afar off and see the structure rise without participating in the discomfort, or better yet, if he has a fondness and capacity for such work, carry it on himself, can steer clear of all extra work, and bring the sum total within the original estimates. And yet, there are old houses enriched by noble memories, characteristic in themselves, redolent of the virtues of their earliest owners, and yet strong in their honest erection, which will do to improve upon, or at least add to; but the difficulties to be overcome in introducing satisfactorily any of the so-called modern improvements will prove much greater than in a new structure, and the chances are more than even that when all is completed the owner will regret he did not pull down and rebuild from foundation to turret.

I can't say with one of Goldsmith's characters in the play of "She stoops to conquer," that "I love everything old," but I love, among other good things, old houses in good repair, not too ugly nor inconvenient, and I like my old house because it is set upon a hill, of quaint architectural beauty, sound in wind and limb, especially the former, about this season of the year, and in March, with commodious rooms and high ceilings, and was built under the direction of an upright man, whose walk and conversation for half a century has left an impress in and about it which time cannot eradicate, and in pulling it down I should feel as did Samson when he bowed between the pillars of Gaza's temple, that my destruction accompanied its fall.

But ordinarily "a house is the shape which a man's thoughts take when he imagines how he should like to live," and the thoughts of a man and woman of this century differ considerably from those of a centenarian in his youth, and it is better that young housekeepers should, under proper guidance and instruction, embody their fancies and thoughts in wood, stone, or brick; but be sure and begin from the inside and build outwardly, and not sacrifice the comforts for external show. A century ago builders of homes did not have to take into consideration any especial styles of architecture. Their fathers' houses had been built upon a hill, so as to avoid swamps and to spy out when the Indians were coming; were upon one model, the *lean-to*, which economised room, and by the low roof for increased warmth and greater convenience, and possessed only one material luxury—to wit, a big fireplace. A century since there were no contrivances, save that for cooking, no other for warming, and none for lighting dwellings, except the "farthing dip." No coal, no stoves, no gas, no lamps, no oil, no sewing machine, no pull-back, no chignon, no carpets, no carpet-sweeper except the broom, no water in the house unless it was brought in by hand, no water-closets, no baths, no pumps, no watches, no fire in any room but the kitchen, no hot-air furnaces, no steam heater, no pictures, hardly any books, no fire on Sunday in church, which it is said is the reason why the minister preached so much about the "place unmentionable to ears polite," and made Dr. Bellamy consider it the best locality to consign unbaptized and unconverted infants to. These negatives are now all affirmatives, and consequently every one about to build anew wants to provide for them, and be as comfortable as his or her neighbors. And it is just as cheap to place your house on a good site, and have it tasteful inside and out, as otherwise. A great many young farmers, who build their own houses, are obstinate about this matter, having a false shame about appearing to imitate some richer neighbors, and the consequence is, to say nothing of how much pleasure they deprive themselves of, that as the neighborhood improves, and they want to let or sell, they meet the objection that their house is not located in the right spot for a view, and is neither tasteful outside nor designed for comfort within. I passed my Thanksgiving week in South Manchester, in your State, where the Cheney Brothers have erected hundreds of houses for the operatives in their silk factories, none of which is like the other, and all are tasteful in external appearance, convenient inside, furnished with gas and water, and cheap as to price in construction, averaging $1,200 to $1,500 each. They have settled the question that ugliness is not a necessary concomitant of usefulness, and that conformity to one pattern is not an absolute requirement, even in homes for factory operatives, and our farmers and artisans may borrow a hint from these examples.

We may be said now to be in the transition state of American architecture, having got beyond lean-tos and gables, passed through the afflictions of Grecian temples and colonades, and are looking about for something appropriate to a climate which is Italy for a short period, and Nova Zembla the rest of the year. The danger is that we may run into a style of "*Progressive American Architecture*," as prefigured in a work under that title recently published in New York, which will spoil all our landscape scenery, and our domicils will so bristle with towers and kindred excrescences, that that of Babel will seem to have fallen upon us, and each fragment sprouted up afresh. It costs more to build one of these hideous pagodas than it does to erect a pretty house suited to the place and surroundings; and if the embryo possessor has not the wit to select for himself, or mistrusts his own taste, he will do better to consult first his wife, and then an architect of reputation, who, for a small consideration, will put his thoughts into design, or prepare one from his own ideas, rather than submit to the crude counsels of a builder, most of whom follow a conventional plan, and can erect only what they have seen. They are more apt to prefer elaborate ornament, which costs dear, to the simple gracefulness which accompanies the useful, and will follow, as women do, the prevailing fashion, however hideous and inconvenient, as Humboldt's Orinoco Indian put on his war-paint, and nothing else, before leaving his hut, not with a view to any direct benefit, but because he would be out of style, according to his narrow creed, without it. I would recommend to your perusal, as pertinent to this part of my observations, and applicable to all about to build, a very charming and instructive essay on "The Moral Influences of the Dwelling," among the first series of "The Recreations of a Country Parson," (Rev. Mr. Boyd, of Great Britain,) republished in this country, and call your attention especially to the quotation therein from a work on rural architecture by our well-known architect, Calvert Vaux, formerly associated with Mr. Downing, who gave such an impetus to landscape gardening, taste in rural buildings, and improved fruit-culture, on the advantages to our children of having our homes beautiful, and showing how many a young soul has had all its true life sodden and despoiled by the meagre, esthetic face premised in the unlovely home; and, instead of "a happy youth and an old age beautiful and free," the crushed, light-hearted boy or girl emerges into a hard and horny middle age, and at last into a covetous, unloving and unloved old age: reason sufficient—*they never had a pleasant home.*

Some one has proposed as a fitting contribution to the Centennial exhibition at Philadelphia, that New Hampshire purchase and remove to that city the house in which Horace Greeley was born, at Amherst, in that state. If the purpose of this is to show how our Second Franklin was born in poverty and cradled in obscurity, and that the struggles of his early life made him always have a fellow feeling for the toiling classes, for whose education and welfare he never ceased to labor, the idea is not a bad one; nor that other, of having a sample log-house of a century ago, such as the father of Daniel Webster lived and died in, and one of those early school-houses on a bleak hill might be added, to which the little bare-footed and legged wretches toddled the winter's day, to be martyred before a red hot stove, or warmed more quickly by the birch of an irate "school-marm;" but if the idea is to show us that our ancestors were as comfortable as they should be, the exhibition of these memorials will be a failure. Even Horace Greeley, after twenty years' experience as a farmer at Chappaqua, where he cut wood as an exercise and recreation from newspaper and political excitement, when referring in his memoirs of himself to his life in that little story and a half building, 30 × 40, seven and a half feet stud, with four rooms, says, "I have often asked myself, How would you like to return to that cot on the hill-side and spend the rest of your days there? and I answered, I would *not* like it." He probably considered it more uncomfortable to think of as a permanent residence, than of that exhausting ride over the prairies in a mail wagon, the only seats being mail bags filled with costly and useless books sent free by Congressmen to their constituents, the points of which impressed Mr. Greeley with the fact that such was not the royal road to learning.

It is hardly worth while to be sentimental on the subject of old houses unless they are comfortable homes or can be rendered such. Our forefathers and puritan ancestors, like all new settlers, had to put up with log-houses and shanties, and knew nothing even of roads save those connections between the houses first made as foot paths, then becoming horse tracks, and with the progress of events enlarged into wagon roads. These, ultimately fenced in, became the highways running irregularly over the face of the country as they were prolonged by settlements. The science of road-making never guided their direction, nor would farmers permit the squareness of their fields to give place to the straightness of roads. But times have changed since then, mostly for the better, roads have improved, homes are more comfortable, education more extended, duty more exacting, life more concentrated, and we must shape our houses as well as our lives to meet the exigencies and improvements of the era, and swim with the tide.

By this time we must suppose our young farmer has got his house enclosed, and we may fancy it tasteful in construction, set not exactly on a hill, but upon rising ground, over a thoroughly drained cellar, well aired, lighted, and whitewashed, sheltered on the north and northwest by some fine old trees, with a green bit of lawn in front, and the rooms so arranged that as mother Earth makes her diurnal revolution nearly every one is exposed in turn to the flaming visage of old Sol, the eating room being the first to receive the genial glow, the drawing or family sitting room the more vertical rays of mid day, whilst the west end of the hall and south of the kitchen ell glows in the retiring beams as the king of our firmament apparently retires to oil up his machinery and replenish the fires of his furnace for the next day's exhibition. With the knowledge to be obtained by enquiry and the perusal of proper books we cannot doubt that the builder has in addition to the clapboards, sheathed and papered the outside, if a wooden house; bricked or dumb-plastered within, and we notice with pleasure that shingles of the best quality cover the roof instead of the more pretentious and costly slate; that a wide piazza runs across the south side with frames of glass to be opened in summer and closed in winter, and in front on the east is a pleasant porch where the future Jacobs and Rachaels can linger in mid-summer eves, instead of hanging as did their prototypes, round the well-curb; that the flower garden has already been started on the south, and not far from it the kitchen or vegetable garden, both of good size, and the latter large enough to be cultivated by the plow, harrow, and cultivator, whilst dotting the grounds in every direction are shrubs and trees, which as well as the flowers, fair hands will tend and their owners find employment as well as acquire robust health in so doing. Beyond to the northwest, and so far north as not to obscure the parting glories of the sunset, stand the barn and sheds, and rather surprising to find is a fine raised and graveled walk leading to and from the house, so that not only can the men come into the house with clean understandings, but can offer the somewhat rare treat to the rest of the family and guests of visiting the saints of the barn and barnyard dryshod. The hens also have a house to themselves with a southerly exposure, glassed in front, where they can comfortably make their lays, and be egged on in cold weather to shell out as profusely as in the summer.

Now comes the question of painting. The rude forefathers of our hamlets either thought their leantos "in naked beauty more adorned," or paint was scarce, and so let the wood take the color exposure to winds, sun, and rain gave it—and not a bad color either, if it was not quite so uniform—but the modern Yankee, equipped in his youth with the three R's, (reading, 'riting, and 'rithmetic,) rivals them in his adult manhood, with the three P's, (pork, pies, and paint,) and uses them lavishly. Formerly he was strong on red paint, sharing the fondness for that color with his brethren of the forest; then he fell back on white, with green blinds; and now he is apt to imitate Joseph's coat, and streak his house with a variety of colors; and it is not rare to see a Zebra-looking domicile, and a green, serpentish barn, and if it were not certain that Barnum had retired from the menagerie business, the beholder might think he had met with a collection of ante-diluvian beasts and reptiles, which the restorer of Joyce Heth was about to witch the world with. Let the colors be of neutral tints—something like the rocks which crop out in the vicinity of the residence, with trimmings if you prefer, a little darker; a French gray, for instance, if a small house, a darker color, say brown, if a large edifice, and let the barn be painted darker yet than the house, so as to throw it in the background. If you haven't plenty of money to throw round, you might imitate the boy in the following anecdote, and paint your house yourself.

A painter was employed in painting a ship in the river, suspended on a stage under the ship's stern. The captain, who had just got into the boat alongside for the purpose of going on shore, ordered the boy, a green hand, to let go the *painter*, (the rope which makes fast the boat.) The boy instantly went aft and let go the rope by which the painter's stage was held. The captain, surprised at the boy's delay, cried out, "You lazy dog, why don't you let go the painter?" The boy replied, "*He's gone, Sir, pots and all*"!

Let him go, and do your own painting, or contract to have the work done and furnish the material yourself, and more paint will get on the house than if found by the artist.

When you come to paint inside, discard the white lead and use only oil, or what is better, Valentine's or some other prepared filling, if the woodwork is hard, as that brings out the natural color of the chestnut, or ash, or oak, without turning it yellow, as oil alone will. If the wood is pine or other soft material, put in the oil something to stain the color you want, and the work is done for ever, and unlike a painted interior which requires a yearly repetition, under the inflexible admonitions of the neat housewife, a little clean water and elbow grease will restore all to pristine purity.

As to *heating*, that problem of the kitchen is easily solved. A modern cook-stove for wood or coal, or a set or portable range, is the perfect instrument for meal preparation, and much as young ladies may rave about fireplaces, and hearths, and brass andirons, their mothers would no more return to the old kitchen wood fires, than the ancient Dives to his warm spot if he had been let out, or the modern one voluntarily to Ludlow street jail. Do we realize the sufferings of those divine priestesses as they basted turkeys or roasted beef before those rousing fires, when not indued with tie-back dresses, they had to gather and hold from the fire their voluminous skirts, whilst the pins on their dresses in front got red hot. Now in a well arranged kitchen the heat is not only diffused uniformly, but is not so fierce as to be disagreeable, and in a range the fire can be kept all night, and it is about as cheap to keep a coal fire going as to let it go out and rekindle every morning.

But the rest of the house has to be warmed also, and here comes the rub. Wood and open fires are entirely out of the question to warm the whole house, unless each house-keeper has a forest of Arden, and then he needs a Puck to order and a Caliban to obey his behests and cut and come again with the wood. As every room has or should have a fireplace as a ventilator, if nothing more, a fire on the hearth can be had in the sitting room, and then you are indulging in a luxury which kings may envy. A fire in the open grate is the next best substitute, but of all abortions and fire devils, avoid the air-tight stove, except as a mere temporary resort. A noted wit being sick fancied he was in a dying condition, and the doctor was called in, who feeling his patient's feet and finding them warm, asked him with some asperity, if he ever knew a man in a dying state when his extremities were hot? Yes, said the sobbing patient, *John Rogers!* I am never left alone in company with an air-tight stove without remembering that suffering martyr, and Prometheus, an earlier sufferer, who was chained to a cold rock and exposed to the vicissitudes of the seasons. At one time you are in an intolerable heat, and your head is like to burst, you shut the draft and in a moment you are at the opposite pole, the air in the room is all eaten up by this voracious monster, and so you suffer alternately from a stifling sensation, or a burning fever, or a north pole current, and feel as bad as Job when he said, "I would not live alway," and rather think the king of Terrors would be a relief to this black despot of Tartarus!

If you can only afford one fire besides that of the kitchen, and think a grate consumes too much coal, you will use, of course, a base-burner; but consider a moment, before you buy one, what a close, intolerable heat you get from it, how it annihilates all the oxygen you and your children should breathe, and how much more predisposed to colds, diphtheria, and all the ills infants are subject to they will be than if kept in a room with an open fire, which both heats and ventilates. It would be about as economical and vastly pleasanter to put a small *wrought-iron* furnace in your cellar, which, with the same amount of coal nearly that your stove consumes, would warm two, three, or four rooms, and allow you to have your house open throughout. But if you can afford it, you can do better than that. The celebrated Beau Brummell, who afterward lost the affection of his quondam boon companion, George the Fourth, by pretending, when meeting him, not to recognize him, and asking the king's associate "who his fat friend was?" on a certain occasion astonished the courtiers by appearing with a neck-cloth so stiff and smooth as to excite their admiration and envy, and it was many days before he would divulge the secret. At last he oracularly said, *Starch is the man!* Now, *Steam* is the man who is to secure for our dwelling a pure as well as warm atmosphere, avoid the dryness and occasional gases of the furnace, and keep our rooms at a summer and uniform heat, whatever the change in the outside temperature may be. The two modes of heating by this agent are styled direct and indirect radiation. The former meaning the system by which steam is carried by iron pipes direct from the boiler round the rooms, or into radiators—cast or sheet-iron—fixed in the apartments. *Indirect* radiation is when the heat rises from these radiators placed under a register, or from a chamber connected with the furnace, in which are stacks of radiators, generally cast-iron, through tin conductors to the registers, and so into the apartments. Each system has its advocates, and scientific men have been employed by the inventors or operators of the furnaces on these systems to write up their respective advantages, and pamphlets are issued with testimonials, which, if all are true, show that each system is better than the other, and the other better than 'tother. Mr. Gardner, the author of the instructive work, "Homes, and How to Make Them," in a series of essays on "House-Warming," publishing in the Springfield *Republican*, argues in favor of direct radiation, whilst Mr. Derby, and if I am not mistaken, Prof. Brewer, who addressed us yesterday, consider the indirect method the best.

> "Who shall decide when doctors disagree,
> And soundest casuists doubt, like you and me?"

Having given the subject a careful consideration, with a view to the introduction of steam, I find myself between the horns of a dilemma.

Direct radiation is, perhaps, the cheapest mode; and as steam through iron pipes can be conveyed great distances horizontally, rooms at a considerable distance can be heated with less difficulty than by indirect radiation. On the other hand, the radiators in the rooms only heat over and over again the air already in them, and have to be looked to very often, as when the steam is off or a fresh fire made, or even fresh coal put on, cold air usurps the place of the steam, and it has to be let out before the steam can be introduced again. By indirect *radiation*, as cold air from outside is constantly introduced into the box or chambers below, which contain the radiators, and the latter are arranged so that the steam will usurp the place of the air in the radiators without assistance, there is a constant uprising into the apartments of fresh external air, warmed and pure.

But, leaving those who intend to try either of these systems (and many furnace-makers combine the two), to study it up as they can easily do by getting the pamphlet prospectuses of the various steam furnace-builders, I can assure those of you who live within two or three hundred feet of a steam mill or manufactory, that you can heat your house in the most economical and delightful way imaginable, by building a small brick chamber in your cellar, putting in it coils of radiators, with tin conductors from the chamber to your several rooms, and then introduce the steam from the mill or manufactory underground to the chamber in your cellar, adding a cold-air pipe from the outside in the bottom of the chamber. Here you have all the concomitants of happiness, so far as that volatile agent is at the mercy of any inanimate subject, and can revel in pure, moist, and healthful air, with but little expense, no botheration with coal, nor danger of a boiler bursting in your cellar (which I believe, though, is impossible with the low-pressure boilers used in residences), and sending you to heaven, or somewhere else, before you have decided when and where to go. And there is no reason why heating by steam should be much more expensive at the start, at least, than by hot air furnaces. The boiler and brick-work should not cost any more, and the price of iron is so low that it can be furnished at very reasonable prices; but the furnishers of these furnaces have not yet seen the low figures at which the materials of which heating and plumbing materials are composed are selling by the importers and commission houses. I found such a large discrepancy as this between the prices of a galvanized forty gallon iron boiler for connection with kitchen range: In a large country town, $32 to $34; in New York, $19.50; freight between the two places, about $1.00; and iron piping, bath-tub, &c., &c., in same proportion. There can be no doubt a steam furnace, heating by indirect or direct radiation, will consume more coal,—at least a third more, so far as I can arrive at results by inquiry of those using both; but to the man who can afford it, the difference in price ought not to be weighed in the balance a moment, when health is in the opposite scale.

But bear in mind that whether you heat your house by a stove, a hot-air furnace, a steam furnace with direct or indirect radiation, or by tapping the boiler or pipe of a neighboring mill or factory, there must be ventilation in the room, *i. e.* means of frequent and entire renewal of the whole body of the air in it either by air ducts, or by the open grate of a fire place. The latter is by far the best, for you can in very cold weather, and ought at all times, in one room supplement the furnace heat by a little fire on the hearth, and give that cheerfulness which is wanting where no open fire is visible.

No one who builds a house now-a-days, fails to provide a sufficiency of drinking and rainwater, and the two (where on limestone soil the well water is too hard,) can be combined in a brick cistern deep enough to be always cool, with a partition of brick, and a little opening at its bottom, in which is placed a box filled with charcoal and gravel, so that the water may filter through from the side in which the conductor from the roof is placed, to the other where the pipe leading to the pump in the kitchen is, and let these conductors be corrugated material, that will expand without bursting when the snow catches and fills up and freezes, and of course an earth closet will be near the kitchen and under the shed, even if it is only a box under a seat with a scuttle of ashes and a dipper. As there is an institution now in all large cities for the prevention of cruelty to dumb animals, something of the sort should be extended to those outlying poverty fiats of ignorance or carelessness where the animals who are not dumb, are daily in the coldest and most inclement seasons compelled to draw water and attend to other necessary and inevitable wants at some distance from the house, after floundering through the snow or ankle deep in mud, to attain the object. No wonder that one quarter of the women in New England are said to die of consumption.

If your means allow you, in addition to heating the house by furnace, to add water either from a spring, or by a tank filled by a pump from the cistern, and carry it throughout the house, there can be no objection if *first*, you are certain your heating apparatus is sufficient to prevent the pipes from freezing: *Second*, if you are a plumber, or can lay by annually enough to provide for the plumber's pretty constant attention, and in this connection, first read at pp. 102 &c., of "Warner's Summer in my Garden," of the philosophical temper of plumbers, as a class. How agreeable they are by the hour, and how much less so by the job. How they occasionally forget an indispensable tool, and how patiently they will sit and wait and converse for an hour or two until their comrade returns with it, if paid by the hour. "Working by the hour tends to make one moral. A plumber working by the job trying to unscrew a rusty, refractory nut, in a cramped position, where the tongs continually slipped off, would swear: but I never heard one of them swear or exhibit the least impatience at such a vexation working by the hour." As plumbers are but mortal men, probably this tender bit of criticism is a cap which fits many heads.

Third, see that by no possible means, the sewer gas can get back through the pipes into your baths, closets and wash basins, and not only contaminate the atmosphere, but induce all sorts of diseases, from diphtheria to scarlet fever, agues, and lesser sicknesses. Most plumbers will assure you that it is impossible for these deadly gases to get through the water traps—but don't you believe it, no trap or other contrivance has yet been invented to prevent the gases from an unventilated sewer from penetrating into the house under certain conditions. See that the sewer pipe has a ventilating pipe from it before entering the house, and that the main soil pipe goes up through the roof, or ventilation is had by access to a flue connected with the chimney, and don't be humbugged off from that, for then the draft will draw the gases out of the house instead of letting them go into the bath-room and house, as they constantly do under the ordinary methods of plumbing. Read the articles by Col. Waring, of Newport, R. I., on the "Sanitary drainage of houses and towns," in the September, October, and November numbers of the "Atlantic Monthly," as they contain the essence of the latest and best knowledge on this subject, and the illustrations will convey to you the exact ideas requisite to secure preservation from those unnumbered woes these modern improvements have introduced where the work has not been scientifically done. (I need but call your attention to the address of Prof. Brewer, for of course you will remember what he has so well said, and read it, when published in the volume.)

Even if you have a well alone, and an ordinary cistern, the greatest care must be taken to prevent any drainage from house sinks, closets, barn yards coming into them, for the fouling of water in this way, by organic matter, is, even in the rural districts, the commonest cause of typhoid fever and blood-poisoning, and other dangerous disorders. To these are added diphtheria and cerebro-spinal meningitis, which, with the other diseases, are too often associated with fermentation in damp cellars. Even where specific disease is not thus directly caused, the indoor exhalations from undrained cellars lower the vitality of the inmates so as to increase their perceptibility to any passing contagion. The farmer who undertakes to raise vegetables soon learns the importance of draining his soil—but he who has a family to raise seems to regard human growth as requiring no particular cultivation.

One word more on this matter, which is the most important topic connected with farm life and farmers' houses, for the water supply of our houses, whether for drinking, culinary purposes, or ablution, should rank next to shelter and food. In addition to its use internally, externally it is a promoter of health and virtue, cleanliness coming next to godliness, and a dirty fellow being about the meanest epithet one can bestow upon his fellow. Therefore, if you have running water which flows into your house, or where you can conveniently use a ram, or can by other means cheaply introduce pure water into the house, and not only save the women the constant running to the well, but give all a chance for weekly if not diurnal baths, do so by all means. I should not advise any one in a country house to run the risk of carrying it into every chamber, but keep it in the ell, or one side, where the pipes are least likely to freeze, and have but one, or at most two closets.

And we must remember one cardinal point, too often overlooked by farmers, that drainage and sewerage do not mean the same thing, the former being the removal from the soil of superfluous moisture, which renders it unfit for cultivation, production, or healthful residence; the latter, the removal of surface water and the refuse of dwellings.

Under all circumstances, wherever, from any cause, water accumulates in the soil round your proposed dwelling, thorough drainage, either under the cellar wall or around the outside of it, should remove it. For this purpose small stones, or, which is better, ordinary drain tile, are used. But these tile, as you know, allow the water, from their porous nature, to enter into them, and they are generally only laid down without the joints being cemented or made tight. Of course they will not answer the purpose of a sewer, which should be cement pipe, vitrified tile, iron, or masonry, so that no refuse matter can percolate into the earth, and thus into wells and springs, polluting and poisoning the water. Farmers, and other people, too, have made sad mistakes, and brought disease and death into their habitations, by using drain tile to convey the refuse from their sinks past and in the vicinity of their wells to a cesspool, or on to the ground, instead of using the proper material.

A sewer constructed without a proper descent, or used without a sufficient quantity of water for flushing it, is simply an elongated cesspool and a public nuisance, and a sewer without proper ventilation is a huge retort in which the most poisonous gases are daily distilled and forced into the dwellings, whenever the wind blows into its outlet. This poison must escape somewhere, either through the ventilating pipe, if there is one, or else through the wash basin, bath tub, and closets in the house.

"Water, like steam, fire, and other agencies of a powerful nature utilized by man, exerts an immense influence upon his physical and moral well-being, but like all great boons, each has its attendant dangers. Vice and crime find in water their chief antidote, just as robbery and midnight murder in the metropolis are frustrated by the free use of gas in the streets and stores. Medical statistics show that the free use of water has in innumerable instances changed entirely the immoral tendencies of the most abandoned profligates, and has checked the progress of disease and epidemics in large communities, whilst on the other hand impure water has been the most powerful ally of cholera, and has fearfully scourged many of our New England low villages, and the end is not yet."

Don't wait to furnish the house completely before beginning to live. Take the best room below stairs, on the sunny side of the house, for a living room, and put in plain strong furniture that you won't be afraid to use, nor have used by the children, and don't put any rooms in mourning with black hair-cloth sofas and chairs, which are about as easy to sit on and about as cool as a block of ice.

There is a store on Broadway, in New York, having on its door the sign *Maison de Deuil*—literally, the house of mourning, being a repository of black goods usually worn on such occasions—but bearing in mind that in old English the *u* and *v* were one letter, I always read it, "House of the Devil," and I wonder how people whose friends have passed away to a happier state of existence, can enrobe themselves in such lugubrious apparel, but fashion in this as in many other instances sins against common sense and good taste. Instead of buying furniture at the coffin-maker's for your parlor, in case you possess no heir-looms handed down from your parents, purchase and read a recent work called "Hints on household taste in furniture," by Eastlake, or some equally good work, get your carpenter or cabinet-maker to fashion something of the sort there represented, or (if, as most young farmers should be, you are familiar with the tools,) do it yourself, and let your wife do the upholstering with some nice, light material; and for bed-rooms, what is better than the clean, white wood sets manufactured and sold very cheaply in all parts of New England, which the females of the family can adorn to suit themselves. I notice at our fairs a vast amount of ingenuity and labor wasted on wreaths of hair, ugly in the extreme, embroidery, leaves, and other articles rarely beautiful, and mostly useless, which, if applied to decorating the furniture, framing the pictures, and useful work, would make the house look charming. Nearly all girls, and boys, too, have a talent for drawing and painting to a certain extent, whilst very few have a real taste for music, and if the compelled labor at the piano were in most cases exchanged for the voluntary exercise of the pencil and brush, there would be a great change for the better in the household.

But don't forget the best of furniture, BOOKS. Rather be scant on your mahogany, black walnut, or other material, and usurp their place with books until you can afford to have both. In addition to your Bible, Shakespeare, History of the United States and foreign countries, and the best biographies, and the necessary volumes appertaining to your business, add such cheerful works as the Pickwick Papers and the Sparrowgrass Papers, two of the most genial and laughter-provoking works ever published; Warner's "Summer in My Garden," and "Backlog Studies;" Gail Hamilton's "Country Living and Thinking;" and as soon as you can afford it, Irving and Scott's works, and either read them aloud or have them read aloud in your family. When there is no sunshine outside, a little good humor and cheerfulness inside is a very good substitute. Did you ever consider what a dull, plodding, tramping, clamping world this would be without some fun in it? As some one has wittily said, "In the ordinary intercourse of society there would be all the stiffness of the poker without its occasional warmth." We Yankees are naturally a humor-loving and generating people, notwithstanding our Puritan ancestors are contrariwise described; and if we would only carry and distribute it in our homes, instead of confining its corruscations to our external acquaintances, gas, and a good deal of coal and wood could be saved, and a summer atmosphere pervade the dwelling. A soft answer turneth away wrath, we know by precept and practice, and a free vent to harmless humor will hinder wrath and other bilious outbreaks. Sancho Panza was not a good model for husbands and fathers of the present day. "Look you, Sancho," said his wife, after he had become Squire to the redoubtable Don Quixotte, "since you have been a knight-errant-man, you talk in such a roundabout manner that nobody understands you." "It is enough wife," replied he, "that God understands me." The greatest of men have not disdained humor as an auxiliary in life's discipline. Plato frequently indulged the gaiety of his heart by relaxing into jocoseness with his disciples, and on one occasion, seeing a grave formalist approach in the midst of their trifling, exclaimed, "Silence, my friends, let us be wise now—a fool is coming!" Sir Thomas More had a natural disposition to pleasantry, which clung to him after his head was on the block, for, as the executioner raised the ax, he desired him to wait until he had removed his beard, "for *that* had never offended the king;" and in one of the last letters to his wife he said: "I pray you to be with my children and household *merry in God;*" in which adjuration he only conformed to the authority of Scripture, which declares that "he that is of merry heart hath a continual feast."

Abraham Lincoln would have succumbed before the grave responsibilities of his position and the conscientious discharge of his manifold duties, had not his labors been lightened and the mists driven away by his pervading sense of humor; and it should be part of the religion of every housekeeper to look well after the cheerfulness of life, and let the dismals shift for themselves. Build it in every joist and rafter as the house goes up; drive it in with every nail; strive as faithfully to keep it in as to keep the cold out, and it will forever continue to pervade the home, like those murmurings which we hear on applying our ear to a shell, "whereby the monitor expresses mysterious union with its native sea."

"The soul of music slumbers in the shell,
Till waked and kindled by the Master's spell,
And feeling hearts, touch them but rightly, pour
A thousand melodies unheard before."

It is now settled among physiologists that cheerfulness sustains and care depresses health, and that a certain amount of happy sensations is necessary to the prolongation of life. And compare any families of children brought up in circumstances otherwise identical, and starting with equal advantages of constitution, and those will be the healthiest, and come to be the most satisfactory set of men and women, that have been in the hands of parents of cheerful and kindly dispositions; that have been most encouraged, under decent bounds, to laugh, to play, to dance and sing; have been least frowned at, awed down and frightened; which, in short, have been made the happiest.

Of course, now that we are in our new house we must eat, and in this connection let me say, that the kitchen is no place for men or their toggery, unless they can be useful or are invited in. It is the woman's workshop, and so soon as two fires can be afforded it is the duty of every man to provide a sitting room where he can occupy himself, and where his wife can come and rest herself from the culinary toils during the intervals of meals at the close of the day. Even the male co-worker would not like to live altogether in his shop, or barn, and the female wants the same privilege of removing herself from the scene of her continued toil, and thinking about something else than the eternal succession of dishes for the devouring ogre. Says Peter Pindar:

> "The turnpike road to peoples' hearts, I find,
> Lies through their mouths, or I mistake mankind;"

and therefore humans must be fed, but they need not be gorged, and the science of eating and drinking is yet in its infancy among us, though much advanced abroad. "It may seem," says the author of John Halifax, "a dreadful doctrine to practical people, but two-thirds of a man's woes (and woman's too) usually begin in the stomach." It has been affirmed that man partakes of the nature of the animal of which he eats, becoming chicken-hearted from too much fowl, sheepish from too much mutton, hoggish from too much pork, &c., but however that may be, it is indisputable that the quality of the food in a great measure determines the disposition, not only of the parents, but the offspring. All are aware of the immense destruction of human life caused by the ambition of the Emperor Charles the Vth to rule the world, and of the bigoted and merciless disposition of his massacreing son, Philip the Second, but perhaps few have traced back the cause of these atrocities to their stomachs, and the quality of food engulphed therein. Charles the Vth, says Motley the historian, was an enormous eater. He breakfasted at 5, then slept again, dined at 12, partaking always of 20 dishes, supped twice, once in the evening and again at midnight, which meal was perhaps the most solid of the four, and worst of all, after meat he *ate a great quantity of pastry and sweetmeats.* His son Philip, inheriting the worst part of his father's disposition and appetite, "was apt to exceed in sweetmeats and pastry," and of course had delicate health and bad digestion, and his son *Don Carlos*, the product of two generations of such grossness—though on account of his early and mysterious death by the order of his amiable parent—romanced upon by Schiller and others—was in reality a *lusus naturæ* in fiendishness. His head was large, his limbs rickety and misshapen, and his appetite so irregular and voracious that he would for days eat no food, and then eat so many patties of mince meat, (what we call mince pies,) as nearly to die of indigestion. He was addicted to roasting hares and other animals alive so as to amuse himself with their dying convulsions: and his boot-maker bringing him a pair of boots which were too tight, he ordered them to be chopped into little pieces, stewed and seasoned, and then compelled the unfortunate mechanic to eat his own boots thus converted into a pottage. How lucky that noble prince was killed off young, even if his father who begat him and his disposition had to do it!

When I find parents who not only eat pork, sausages, pastry and high seasoned food, with scarce a vegetable three times a day, but allow the children to do the same, and indulge the latter in gingerbread, and other sweet cake, when their appetite for good bread has waned, I think how many Don Carloses are growing up, and how difficult it will be to train up such children to be useful and honest citizens. Having been a breeder of fine stock, for many years, I am more and more convinced that viciousness can be bred out of bulls and horses, mildness and milking qualities into cows, in addition to color and form, and the same rule holds good with human stock. Feed colts or young bulls heavily with grain, and no man can manage them unless he breaks their disposition down and destroys the essence of their life, but with unexciting food, gentle handling, they can be trained in the way you want them to grow, and so universal is this rule that it is rare to meet a vicious, thorough bred bull, and nearly all horses are educated, not broken in the old brutal fashion, to harness.

Therefore if parents will live on too much flesh-meat, pastry, and exciting food and drink themselves, let them bring up their children as the English middle class and races, and the more intelligent of our people do theirs on oat meal, graveys and vegetable food, bread and butter, and meat once a day, with "sweets" only occasionally. There is hardly a Christian family in the land which has given any attention to the subject of dietetics, but has for breakfast oat meal por ridge, or wheaten grits, and some baked apples or fruits of the season, and we need all to remember that the grains are more nutritious than meat or vegetables, and no nation can preserve its vitality and its tendency to progress on a diet of pork and potatoes. The best beefsteak has only about 38 per cent. of nutrition, but a little more than the potato, whilst the grain we call wheat has 85 per cent. nutriment in it. Shoemakers' children are said to go barefoot, and farmers who raise the grain and vegetables are less apt than other classes to use them freely, but the good time is coming, and as men are now preferring lean pork to fat, so soon they will prefer a greater variety of diet and live more on grains, vegetables, and lessen the quantity of animal food. To assure you I am not prejudiced against the pig—certainly not so much as the French people, who avoid mentioning him, and when they have to do so use a periphrase and call him by a word meaning "dressed in silk," or if hard pushed, style him "*a pork*," as some of our over modest feminines style a bull—the gentleman, I refer you to an essay on that historic animal written by me some years ago, for and published in the transactions of this board.

I would also ask you to read Mr. Beecher's "star paper," entitled "Building a House," and his essay on "the duty of owning books," p. 154 of "Eyes and Ears," as comprising many things I should like to say to you if there was time, but they are better said there. Of course you will read the Bible in the new house and try to follow its precepts, and the example of how to live for others, contained in the New Testament, but it perhaps won't do any harm, if, in conclusion, I pass round the following scrap.

HAPPY EVERY DAY.

Sydney Smith cut the following from a newspaper, and preserved it for himself:—

When you rise in the morning, form the resolution to make the day a happy one to a fellow creature. It is easily done, a left-off garment to the man who needs it; a kind word to the sorrowful; an encouraging expression to the striving,—trifles in themselves as light as air,—will do at least for the twenty-four hours. And if you are old, rest assured it will send you gently and happily down the stream of time to eternity. By the most simple arithmetical sum; look at the result. If you send one person happily through the day, that is three hundred and sixty-five in the course of a year. And suppose you live forty years only after you commence that course of medicine, you have made fourteen thousand, six hundred persons happy, at all events, for a time.

Adjourned to seven o'clock.

EVENING SESSION.

The Convention was called to order soon after seven o'clock, by Mr. H. L. Stewart, and Mr. P. M. Augur, Pomologist of the Board, read his report, as follows:

REPORT OF P. M. AUGUR, POMOLOGIST.

To T. S. Gold, *Secretary of Connecticut Board of Agriculture:*

While the year now closing (1875) has been bountiful as a whole in its agricultural products, it has fallen far below the average in the yield of the Apple, not only in Connecticut, but throughout our country.

The great apple-growing States, New York, Michigan, and New Jersey, report about two-thirds of a crop. Our State reported through the Agricultural Department at Washington, by Counties, $\frac{54}{100}$ of an average crop, which we believe an over estimate. Many farms whose orchards produced heavily in 1874, have this year not yielded more than one-tenth of an average crop; and yet, some orchards, having had good care and culture, have yielded a fair crop, which at increased prices has brought an average value.

Where the apple crop was excessive last year, and much fruit was allowed to go to waste, the apple worm left a numerous progeny, which has caused the fruit this year to be particularly imperfect and wormy. Such a result may be averted by destroying the apple worm in the larva, or in the pupa state. There are obvious lessons for us to learn concerning the productiveness of our orchards and the quality of our fruit from the experience of the two past years. Standing on the verge of another year, let us endeavor to secure more and better growth, and if possible avoid such excessive crops as we had in 1872 and 1874. We can, to secure this, do as follows:

1st. Thin out the fruit bearing wood, and if in June the trees show too much fruit, thin out the fruit.

2d. Secure a state of health in the trees; a smooth clean bark and healthy foliage are very important to obtain perfect, well matured fruit.

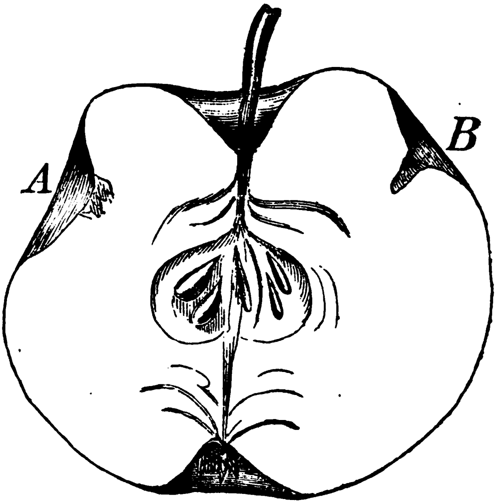
3d. Provide abundant nutriment. Three elements are especially needed, both to secure a healthy growth, and fine, well colored fruit, which are often lacking in soils, viz: potash, phosphate of lime, and nitrogen. The nitrogen is found in sufficient quantity in fine stable manure, potash and phosphate of lime in a mixture of unleached wood ashes and finely ground bone in equal quantities, moistened with water, the mixture to stand in barrels, covered with ground gypsum (plaster of Paris) to prevent the escape of ammonia. This mixture applied to any kind of fruit trees, will secure very satisfactory results.

But if you see a promise of too much fruit, you will be well paid by going over your orchards and thinning out fruit in June. If one-quarter, one-third, or one-half the young fruit be jarred off at that time, and carefully gathered up and destroyed, you have your apple crop augmented in value, you save your trees from severe exhaustion, you will have made a vigorous raid upon the apple worm, and have taken the first and surest measures to secure a succeeding crop.

I would by no means warrant that apple-trees so treated will certainly produce annual crops without exception, but I am confident they will have that tendency. To secure fair apples, needs not only care and culture in our orchards, but especially in our New England States, a constant war upon insect enemies. This alone can remove the bad reputation we have of producing imperfect apples.

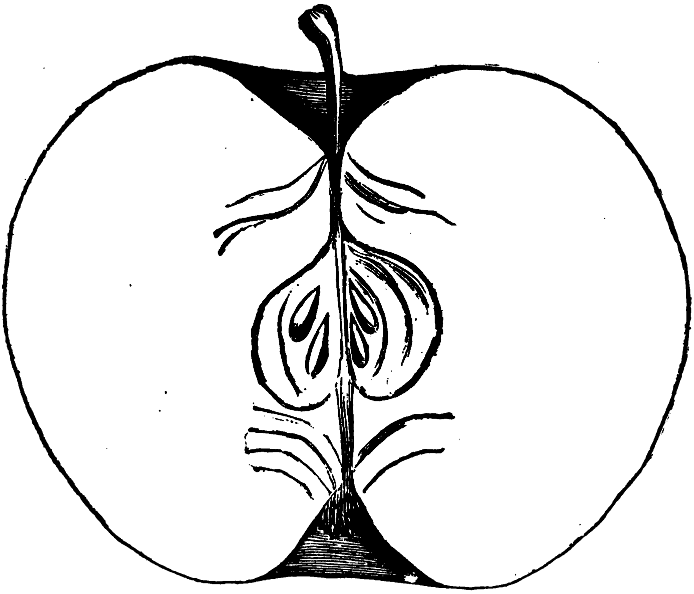
Much vigilance is needed early, to prevent the attacks of the curculio; the depredations of this insect, more than any other, occasion unfair, imperfectly developed apples. See A, B, Fig. 1.

Fig. 1.—Northern Spy Apple, Punctured.



The same apple otherwise might attain the proportions seen in Fig. 2. A large proportion of punctured apples fall prematurely, but many remain disfigured specimens like Fig. 1. How shall we prevent the ravages of the curculio?

Fig. 2.—Northern Spy Apple, Not Punctured.



1. We should encourage the birds to make their abode in or about our orchards. One gentlemen in our state (B. H. Atwater of Berlin, Ct.), has one hundred bird houses in his orchard. A large portion of these are occupied by active little workers who feed upon noxious insects.

2. We may use to advantage "the Ransom chip-trap," being merely pieces of shingles, bark, or bits of board laid on the smooth bare ground at the base of the trees in May, just after the blossoming season; when the curculios emerge from the ground they take shelter under these during the chilly nights of spring, and can be easily captured in early morning.

3. Jar off and destroy all punctured specimens as far as possible; this serves a double purpose of thinning out the fruit, and destroying the larvæ of the curculio and also of the common apple-worm.

The pear in Connecticut has as yet been cultivated only to a small extent, compared with the apple. The grounds of almost every house-holder have a small number of pear trees, ranging from three or four to twelve or fifteen, and occasionally an orchard is found of from half an acre to two acres, and one orchard in Connecticut of 18 acres.

As a whole the soil of our state may be regarded as suitable for growing the pear; and those who have given good culture and care, have in almost every instance been entirely successful. At the Fair of the American Pomological Society, at Boston, in 1873, Massachusetts had the best collection of pears and Connecticut the second; showing that our New England soil and climate are adapted to the production of choice pears.

The present year has been favorable for the pear, and the yield has been fair generally in our state.

The blight has caused some trouble, and yet we have suffered less than Western New York, Michigan, or other states south and west.

Cracking of the fruit of the old White Doyenne, Flemish Beauty, and to some extent, some other varieties, is another trouble for which, as yet, there is no remedy.

The attention given to pear culture is increasing, more trees having been set in our state during ten years past, than during any former decade. There are several encouragements for this, viz.:

1st. The general healthfulness of the trees.
2d. That pears are rarely cut off by untoward seasons.
3d. The excellence of the fruit.
4th. Its market value.

In view of these considerations our State should yield a full supply of this delicious fruit of such good quality as to defy competition from abroad.

THE PEACH.

This fruit is too well known and valued to need any praise. The cultivation of the peach in our State, considering the climate, the prevalence of the "yellows," the depredations of the peach borer, the usual short life of the trees, and often the uncertainty of the crop, involves a serious question whether it is wise to attempt peach growing; indeed, the profit or loss from a peach orchard may depend upon any one of several conditions. Our climate is of course beyond personal control, but altitude, shelter, and exposure may be selected so as to secure safe climatic conditions. A high hill, with a northern slope, sheltered by natural forests against prevailing winds, is the safest place for the peach, and if above or in proximity to some lake or river, there is an additional advantage. Peach trees in Connecticut so situated have borne fruit annually with rare exceptions; but on suitable soil in most localities in our State, peaches may be raised in favorable seasons. This year has been a good one in this section for the peach, and trees in good health and condition have borne good crops. The month of January last, 1875, was very cold, and the mean temperature lower than for many years, yet the cold was not so intense at any one time as to destroy fruit buds.

A high northern slope, with shelter, autumn mulching, and the selection of hardy varieties,—as the Old Mixon, Barnard, and others,—are recommended as safe measures to insure success.

I can hardly leave this delicious fruit without touching upon "*the yellows*," the disease so destructive to peach orchards, north, south, east, and west. In visiting the fruit region of Michigan last fall, I made special effort to find if possible more light in regard to this pest. The disease called yellows first showed itself, according to Downing, about the year 1800; attention was first called to it in the vicinity of Philadelphia, where many orchards showed sudden decay and death without any apparent cause; the disease extended in various directions until it involved to a greater or less extent nearly if not all the peach growing sections. There is no question but that the disease has been carried to very many localities where it was not known before, by the purchase of trees from nurseries where it prevailed.

What is the nature of the disease? We have all observed that trees affected by this disease show enfeebled vitality; the natural forces seem clogged; the foliage looks sickly; the growth is diminutive, and the fruit premature, unnaturally colored, usually flecked or spotted, unusually red at the stone, and the flavor insipid and watery; in short, the trees are unsightly and the fruit small, unhealthy for use, in fact nearly worthless. That the disease is contagious there is no doubt; that it is hereditary is also true. Seed from unhealthy trees will produce diseased nursery stock; buds from diseased trees carry the disease where inserted. The pollen from the flowers of diseased trees is believed to carry the disease to other trees which are contiguous. When the disease shows itself in an orchard it is difficult to eradicate, unless the trees showing the first symptoms are promptly taken out, root and branch.

At South Haven, in Michigan, a Vigilance Committee act in this matter by visiting the peach orchards and ordering out every tree that shows the first symptoms of disease, which usually is the flecked or spotted appearance of the fruit.

In our State, in several instances, plates of peaches were exhibited at the fairs last fall showing conclusively that they were from diseased trees.

Is there a remedy?

To devise a remedy, it is important to know the cause of the disease. Prof. Beal, Microscopist of the Michigan Agricultural College, has been and still is making investigations to learn if possible the cause of the disease; he has detected three or four different forms of fungoid growth. Species of fungi have been found attached to the roots of diseased trees, and fungoid matter has been found to so adapt itself as to enter into the entire circulation of the tree.

Prof. Redzie, of the same college, is inclined to the opinion that the disease may be traceable to this cause, and that an enfeebled condition consequent upon excessive bearing, or other exhausting causes, may greatly increase the liability to be attacked. Again, in the analysis of the ash of the healthy and diseased peach tree, it has been found that the diseased tree has lacked noticeably in two important elements, viz.: potash and phosphoric acid. Now as it is an established fact that these two are of the first importance among the inorganic elements of plant or tree growth, this deficiency suggests a remedy.

Again, Thomas Taylor, Microscopist of the Department of Agriculture, Washington, by experiments in July, 1872, reported on page 387 of the August and September number, found that spores of the *neomaspora*, or peach tree fungus, were destroyed by contact with caustic potash. All these things point strongly to this policy, viz., to keep our peach trees supplied with a requisite amount of potash in the soil.

In answer to the question of remedy for yellows in the peach, I would say, remember the old adage, "an ounce of prevention is better than a pound of cure." But you have the yellows and prevention is out of the question.

Well, in a young orchard of promise, I would take out all diseased trees if the cases were comparatively few; but if the orchard is of bearing age, and trees are of fair vigor, the following remedy may be used, viz.: during the growing season when you see your trees are diseased, (and know that it is not the work of the borer,) lay the roots bare for two or three feet around the tree. Then commence on the main branches just above the head of the tree, and pour a mixture of *hot* water and unleached wood ashes, to the amount of two or three gallons if it be a bearing tree, so that the branches, trunk, and roots may be thoroughly heated by this potash mixture. The effect is two-fold:—1st, as a remedial agent; 2d, in supplying a needful constituent of plant growth, soluble and ready for immediate absorption. This is thought by many in Michigan to palliate if it does not eradicate the disease.

It is well known that where a tree is nearly girdled by the peach-borer, an appearance strikingly similar to the yellows is manifest. The importance of constant vigilance to baffle this enemy is apparent to all cultivators of the peach.

To those who contemplate purchasing peach trees we say, be well assured that you get your trees from a healthy source. Avoid trees raised from the pits procured at any canning establishment, or you will be liable to get disease at the outset; and if you can secure seed from healthy seedling trees of good quality standing somewhat apart from other trees, it is an object worth seeking for, inasmuch as you may in that way have fruit of fine quality without budding and have trees of more hardiness and vitality.

From all I can learn of Peach Orchards in New England, New York and Michigan, I have reached the conclusion, that the very great loss of peach trees, involving, as it has in many instances, thousands of trees, especially in the peach region of Michigan, is owing much to the rapid forcing of trees of bad heredity, into early and excessive bearing, coming in with a heavy crop of fruit in a period of drought, the trees having few except surface roots. After such intense exhaustion, a severe winter often completes the work of destruction, and the result is attributed to the severity of the cold. Whereas trees of good constitution, deep roots, and having borne only moderate crops, with an autumn mulch should have endured.

THE GRAPE.

The grape is one of our important fruits, and deserves the attention of every man who owns a place, however small.

The crop of grapes, this year, has been very good, and many fine dishes have been exhibited at the different fairs of our State.

The Concord still has the preëminence, as to utility, and productiveness. The Hartford Prolific, the Ives, Rogers' No. 4, 15, 19, the Diana, and the Delaware, have, in most places in our State, done reasonably well. There are several other varieties that have done well under favorable circumstances, but are too uncertain for general cultivation.

We have still to look for a grape of first quality, which shall be hardy and certain as the Concord, and early enough to ripen its fruit every year. To produce a grape of such character is worthy the effort of all persevering pomologists. Efforts have been made, and will continue to be made, for this object; there are already some seedlings of considerable promise, and there hardly can be a doubt, that of all, in our State, and elsewhere, who are laboring to produce new varieties, some will achieve success.

THE PLUM.

Owing to the fact that the curculio, and the black-knot, prevail so generally, plums *bring a good price* and *find a ready market.* Yet the opinion is common that it is very unprofitable to spend time or money in cultivating this fruit. This is true, unless thorough attention can be given, but with that I believe the fruit can be grown with much profit; here are the important points. 1st. Secure trees with good seedling stocks of varieties, such as the Lombard, Shropshire Damson, and such few varieties as can easily be raised and readily sold.

2nd. Let them be set in a plat together, so that you can attend to them daily, in the curculio season, which is usually from the time the young fruit appears visible for a period of four or five weeks.

3d. Make a business of attending to the trees, catching and killing the curculio as often and as regularly as the dairyman milks his cows, and you may astonish yourself with the abundance of plums you produce. Add to your plat of plums, one or two hardy varieties of Apricots, and Nectarines, and let them also share the daily visitation, and they will also reward you with fruit. A good, easy, but less sure plan is to drench the trees with a wash used by Dr. Howe, of Birmingham, Conn., which I have tried and found of value, viz: "Take six pounds of whale oil soap, and one pint of tar, boil in a few quarts of water, till they are thoroughly dissolved, then mix with forty gallons of water; by the use of a garden syringe, drench the trees with this liquid, as soon as the flowers have fallen, and repeat at intervals, (particularly after each heavy rain,) until the curculio season has past, usually three or four weeks. I have found this, when *faithfully* applied, effective in repelling the curculio, and it is, also, of some benefit as a *preventive* of *black-knot,* though I would not recommend it as a *cure* where it exists.

This leads me to say that the *black-knot* is in some localities a terrible scourge to the plum, and also to the cherry. This is undoubtedly a fungoid growth, propagated by spores; so to be free from it, at once eradicate it by the free use of the axe, saw, or knife, as the case may be, and as a preventive, keep your trees clean and healthy, by washing or drenching with soap-suds, and always removing the knot on its first appearance; with you, or with the black-knot, possession is "nine points of the law." With good trees, of good varieties, and good culture, a freedom from curculio and black-knot, plum raising would be easy, pleasant, and profitable.

THE QUINCE.

There is quite as much to discourage in growing the quince as the plum, though in a different way. In numerous communications I have received from different parts of our own, and other States, the same cry of discouragement comes from all quarters, viz: the unthriftiness, and death of large numbers of trees. To illustrate, let me give some instances; a former member of this Board of Agriculture set out twelve quince trees, some four years since; in one year he had three trees left which showed feeble indications of life, the others had all failed.

In the spring of 1874, I procured and set for an orchard, 125 quince trees, they were the Orange quince, raised from stools. I took great care in setting, mulching and cultivating them. In the spring of 1875, one year later, I had lost only six trees, I again mulched and gave a moderate dressing of fine manure. I had determined to make that a *pet orchard*, a *model orchard;* well, what was the result of the second years growth; my 125 trees, which had been made good by filling in the six vacancies, had been reduced down to eighty-seven trees, that is, I had lost thirty-eight trees, under the best cultivation I could give. Of the eighty-seven trees now alive, seventy-two promise to live, but of these, only fifteen have come really up to my expectations, as to vigor and thrift, and yet I judge that I have been as successful as most who have started in the same direction.

Now, why this loss? I attribute it to the manner in which the trees are propagated, viz: from stools. The parent stock, under a forced and stimulating treatment, is made to produce as many young plants as possible, which, instead of remaining to add vigor to the old plant, are taken off, thus depleting it, and this process goes on from year to year, giving us a stock of trees deficient in vitality, and many of which, in consequence die, involving a loss of time and money to all who invest.

What I now propose to do is this. I have seed from choice quinces, grown from vigorous trees. If my life is spared, I propose to fill the places of all except the most thrifty of my trees, with vigorous young seedlings, of the Orange quince.

And thus, I hope ultimately to have a quince orchard, of sufficient vitality to endure the frosts of winter and the drought of summer.

A large proportion of the loss, and failure in attempting to grow the quince, I think, may be traced, as I have said, to enfeebled vitality, but not all. The borer is an inveterate enemy to the quince, destroying many trees every year, in all parts of the country. Examine your trees often, use a knife and flexible wire, and about the 1st of June, each year, make a free application of diluted soft soap: it gives vigor to the tree, and is a preventive of the borer, the eggs of which are deposited at the base of the tree, in the months of June and July.

The quince should have a moist deep soil, generous culture, and good care, and whoever succeeds in producing choice fruit, will secure a good price, as the market is scantily supplied.

THE CHERRY.

This is a delicious, healthful fruit, and one that should find a place about all homes, for family use. It thrives on most soils, does better in grass than in mellow ground, making a more moderate and healthy growth. The trees should branch low, so that the trunks may be protected from the direct rays of the sun. The trees, in many places, suffer from black-knot, (*Sphæria morbosa*,) and the same caution should be used here as for the plum; the foliage, too, often suffers from the cherry louse, (*Aphis cerasi*,) which appears in June, and often destroys the crop. When they first appear, dust the tree when the dew is on, with dry fine air-slacked lime, or syringe with a wash of whale-oil soap.*

THE MULBERRY.

This fruit, though but little cultivated, is worthy of more attention than it has hitherto received.

The Black Mulberry is a hardy, prolific tree, yielding fruit abundantly, ripening for four or five weeks consecutively. Several trees have come under my notice. It is a tree that can be readily grafted upon the common white mulberry. I having tried it successfully.

THE STRAWBERRY, RASPBERRY, AND BLACKBERRY

Are fruits of great value, for family use, as also for market, and there are quite a number of cultivators of these fruits who are meeting with a decided success. In this respect, I have heard of no instances, except about Boston, where greater yields have been produced, than in our own State; our soil, and our situation, with reference to markets, are such as to justify the highest degree of care, skill, and energy in producing these fruits.

THE CRANBERRY.

The cranberry is being cultivated in Connecticut, to a considerable extent, and the fruit is of so great value for cooking, and for its keeping qualities, as to merit all the attention which has been, or which may properly be given to it. And we are glad to know that satisfactory results have attended these efforts.

The way of procedure to secure complete success has been treated of somewhat at length, in a preceding report, so I will not repeat, but would refer to pages, 335–345, of vol. 1872, Connecticut Agricultural Report, to those who may desire more definite instruction in this matter.

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* *Rivers* in his "Miniature Fruit Garden," gives, as the best remedy for *Aphis*, the following: "Boil four ounces of quassia chips in a gallon of soft water, ten minutes, dissolving in it, as it cools, four ounces of soft soap; it should be stirred and the trees syringed with it twice or thrice: the day following they should be syringed with pure water."

The natural requisites of a cranberry meadow are—first, a soft plat, inclining to produce moss, so situated as to be easily flowed: 2d, a running stream that can be readily used for flooding the meadow, in November.

3d. A clean sand, free from loam, near at hand, that can be used for sanding.

These conditions would strongly invite the investment of capital for the perfect preparation of a first class cranberry meadow.

There are three general varieties, the Bell, Bugle, and Cherry. In setting plants, care should be taken to get those which are healthy, choice, and productive. Those who contemplate starting in this business, I would refer to Dennis Tuttle, of Madison, Capt. Penfield, of Essex, W. D. Willard, of Clinton, James A. Bill, of Lyme, Z. H. Small, Harwich, Mass., and Joseph Hinchman, Medford, N. J., all men of experience and eminent success in this business.

A question has been often asked within a few years past: Is there a decrease in the vitality of fruit trees? and if so, *how is it accounted for?*

Under any natural plan of production, either in the animal or vegetable kingdom, there is little danger of loss of vitality below the normal standard, for this reason: the stronger always crowd out the weaker of any species. This is true of the animal world, and is no less true of trees and plants. It is true that wild fruits are often sharp and astringent, hard and choky, but the trees are almost invariably *hardy* and *long-lived.*

Now man has effected a wonderful change in the quality of fruits, and in no period of the past has so great a change been made as during the last fifty years. What was formerly coarse and tough has been made fine, delicious, and melting: for this we may well rejoice and be thankful.

But on the other hand, we have been and still are by a general careless manner of propagating trees and by a reckless system of neglect and mismanagement, inviting blight, yellows, mildew, pre-maturity, and feebleness at such a rate as to startle and alarm us.

While the Endicott and Orange pear trees of Massachusetts yield their fruit to grace the exhibition tables of our great national pomological fair, after two and one-quarter centuries of life, health, and productiveness, how do we regret to see the young trees of our gardens succumb to the subtle influence of the blight, and ponder the question, why is it? When we occasionally find an old peach tree, forty, fifty, or sixty years of age, whose leaf is green and healthy and whose fruit comes in its regular season of maturity, whose buds have opened with beauty and shed their fragrance upon the air of spring for more than half a century, how do we regret when we see our trees show debility and decay ere they have perfected their first crop or reached the middle of their first decade.

I have a Native grape-vine whose stem is seventeen inches in circumference, nine feet in height, and whose branches cover a horizontal trellis of five hundred square feet area. Each year this vine produces its abundant crop of purple clusters; each year its leaf goes unflecked by blight till autumn's frosts; while at a little distance stands the Iona, tantalizing by its fine quality and in its puny weakness a very mockery.

Farmers of Connecticut, these things ought not so to be. We believe it possible to obtain quality without the sacrifice of vitality. Mr. Clapp, of Dorchester, Mass., produced the seedling pear bearing his name, supposed to be a cross between the Bartlett and the Flemish Beauty, of excellent quality, and in hardiness and vigor surpassing either of its parents. Other instances of the same kind might be adduced, but as a stream does not often rise higher than the fountain, let us, in seeking to secure trees of strong vitality, be cautious to get seed inheriting just that quality. Seedling stocks of inherent vigor form a safe basis to start upon, in my opinion. More than half the troubles we are now experiencing in fruit culture arise from impaired vitality in consequence of diseased and imperfectly developed seed; small seed and diseased seed produce feeble trees; these are enormously forced to make up the deficiency; this unnatural growth aggravates and augments the difficulty; and to-day we can see just these evils showing everywhere from Maine to California. How rare is it to see one unbroken orchard: how very common it is to see worthless ones! When we depart from Nature's laws we are sure to suffer in one way or another. How important then in the vegetable as in the animal economy to conform to the true principles of nature.

But if it is a great evil to use imperfect tree seed, it is as great perhaps to propagate from feeble buds. A new variety of grape may be and often is vastly injured in this way. Did you ever pay five dollars for some new variety of grape and receive a little spindling plant carefully done up in a little tuft of moss, and after five years of patient waiting find you had been sold? If I mistake not, many a man can say amen to that in all honesty. The facts and experience of the past loudly call for a reform in this respect.

NEAR MARKETS.

Fruit growers of Connecticut have a strong motive to produce fruit where circumstances favor from the fact that we have near and ready markets for our fruit. Our State is traversed east and west, north and south, by railroads, so that whether we wish to supply the cities and manufacturing villages of our State, or to reach New York or Boston, in any case we are within six hours of the desired point. Consequently the most tender fruits may be shipped with comparative safety, and this of itself is a strong encouragement to fruit growers.

CLIMATE.

Much has been said of the favored fruit belt of Michigan, and yet last winter completed a work of destruction there proportionally greater than I have ever seen in Connecticut. It is true that the extreme cold of winter does sometimes cut very keenly, but if we can in some degree avoid destruction of our forests, if we can encourage the general planting of belts of some hardy evergreen, like the Norway spruce, particularly for orchard shelter, by so doing we may add safety to our orchards and beauty to our landscapes.

On the whole the careful cultivator of fruit has much to encourage him. If he has suitable varieties and makes a judicious application of requisite means to desired ends, he may reasonably expect a fair degree of success.

CENTENNIAL.

I hardly feel willing to leave this subject without calling your attention to the approaching Centennial Exhibition. Shall we, the State of Connecticut, appear before all the nations of the earth with our hands folded,—and do nothing? or shall we, in the spirit of the old '76, Putnam-like go, not indeed to Bunker Hill, but to the "city of brotherly love,"—there to win the laurels of peace?

Our State legislature made an appropriation to aid in exhibiting the products of Connecticut industry. To make a full show of Connecticut fruits will require time and money, but with moderate encouragement our State would make such a display as would excite the admiration of the world.

Will the Board of Managers appropriate a portion of their funds to secure a proper representation of the fruits and other agricultural products of our State? Suppose that each town in our State should through the zeal and public spirit of some enterprising man, send her special and peculiar fruits, cereals, and vegetables, each specimen perfect and without blemish, and let all these collections be arranged by counties in one grand collection; each plate neatly arranged, labeled with a card, bearing our State insignia, also name of fruit; specifying the county, town, and individual from whence they came. With such a plan faithfully carried out, there would be such a collection of agricultural products as no State in our Union has hitherto made or even approximated to.

In closing, allow me to say, engage in the culture of fruit with ardor, intelligence, and persistent care. Never be weary of well doing in your orchards and gardens. A valuable machine owes its chief value to its perfect finish. To effect this every operation in its construction must be complete. Let the same principle be applied to fruit culture. Perfect fruit is Nature's unimpeded work. Imperfection results from opposing causes, which you should prevent or remove. Man's first work was in dressing and keeping Eden; his diet the fruits of Paradise.

The good dressing and keeping of our fruit gardens will spread beauty and plenty around, light and love within our homes,—will do much to make them like the Paradise of old.

QUESTION. What is the best soil in which to grow the quince,—a moist soil or a dry one?

Mr. AUGUR. I think a moist, deep soil is the best. If too wet, it should be drained, but a soil which is naturally moist, not a dry soil.

Mr. ROCKWELL. I would like to inquire with regard to the cultivation of the quince. I have been told that single plants do not thrive, but when planted in clusters of two or three or more, they do very much better. Have you any information to give in respect to that matter?

Mr. AUGUR. The finest trees I have seen in Connecticut, have been trees with a single stem.

Mr. ROCKWELL. Do you mean, all the suckers pruned away?

Mr. AUGUR. Yes, sir; the finest and most beautiful trees I have seen, have been of that kind. It is very much easier to prevent the ravages of the borer, if you have a single stem, than where you have a cluster, between the different stems of which they can work. A quince tree should be pruned a little every year, to avoid cutting off large branches.

QUESTION. Is not that so with the pear tree?

Mr. AUGUR. I think so.

Mr. OLCOTT. What varieties would you recommend?

Mr. AUGUR. The orange quince is generally considered the best. It is the most beautiful and the most salable, I think, although there is one disadvantage about it, it ripens its fruit earlier, and does not keep as long as the pear quince.

QUESTION. Have you had any experience with the Rea's Mammoth Quince?

Mr. AUGUR. I have not, personally; but from the fact that it is very little cultivated, I infer that it is not as good a variety for general cultivation as others.

QUESTION. I should like to ask what you consider the best remedy for bark lice on apple trees ? They are a great pest in our section.

Mr. AUGUR. My great remedy for all those things is soft-soap. I think that a solution of potash, in the proportion of one pound to a gallon of water, will probably be effective, but it should be done in the latter part of May. The scale which we see on the tree is merely the covering of the insect, which is very small. The insects emerge in early summer or in late spring, and just at that time, an application of strong soap suds, or potash water, applied not only to the trunk, but to the branches, as far as you can reach, will be quite effective.

QUESTION. After the tree leaves out, or before ?

Mr. AUGUR. Afterwards. In the fall of the year, the insects are sheltered; they are under this scale. They emerge in the spring, as I have said, and then, if the application can be made, it will be very effective. Whenever this parasite is found, it should be promptly attended to. I know that pear trees are very often neglected until they are destroyed. The trees become sickly, and if it is allowed to go on, they will die. I think it is as important that a tree should have a healthy bark, as that the skin of an individual should be kept clean. The operation of the bark is very much like the operation of the skin of a man. The bark is the laboratory of the tree, so to speak. The digestion of the tree is carried on there, and if the bark of the tree is sickly, covered with moss, the healthy action of the tree, as a matter of course, is very much impeded. We cannot insist too much on the necessity of having healthy bark and healthy foliage.

QUESTION. What do you apply the soft-soap with ?

Mr. AUGUR. A little whitewash brush, or an old broom ; but a brush is better.

Mr.———. I have two apples that I would like to hand to Mr. Augur, and have him explain a little phenomenon which occurs very often. They both grew upon the same tree, and one has a number of hard bunches or knots in it. Is there any preventive ?

Mr. **Augur.** Well, sir, I think the best way to avoid all these imperfections in fruit, is to treat the tree in such a way that it shall have a full supply of nutriment, and shall be kept in its most healthy state, so that the action of the leaf and bark shall be perfect, and then, if possible, avoid all the depredations of insects, like the curculio, or any other insect that may attack the fruit. Where we find these knurly and imperfect places in fruit, it seems to be owing to a want of healthy action somewhere. Where fruit is punctured or stung by some insect, a diseased state of the skin follows, and the healthy action is impeded. Perhaps it may be illustrated by a person having a withered hand. If the circulation of blood through the arm is impeded, and the assimilation of healthy blood flowing through that member is stopped, of course there is no further development. If we can manage to keep our trees in perfect health, and prevent the depredations of insects, we can do very much to secure healthy and fair fruit.

Question. What shall we do to keep the curculio, and other insects from stinging fruit ? What is the best preventive.

Mr. **Augur.** Well, sir, in Michigan, they adopt this method. The ground around the tree is made very smooth, all the grass and turf removed, and they lay pieces of bark or chips about the roots of the trees; and early in the season, when the curculios emerge from the ground, when we have chilly nights, they take refuge under the bark or chips, and early in the morning, these pieces are taken up, turned over, and the insects taken off and destroyed. Vast numbers are destroyed in that way. It is well-known that the curculio commits great depredations upon the apple, as well as the plum ; and if we can catch them in this way, and destroy them, or if we can drench the trees so as to drive them away, any of these remedies, as far as they operate, would have the effect to ward off or prevent their ravages.

Mr. ———. I had a Northern Spy last year, that had about twelve or fifteen bushels, and every apple perfect. This year, it bore three or four bushels, and not one really perfect. I had a tree of another variety, which had about the same number of bushels last year, very perfect. This year, it had about two bushels on it, and almost every one decayed before it was ripe. Perhaps they had been stung by some insect?

Mr. **Augur.** It is a fact, which I suppose you have all noticed, that every fruit is much less perfect this year than last. The year before was a barren year, and the apple worm, and those other insects did not propagate to any great extent, on account of the scarcity of fruit. If there were absolutely no apples any one year, the following year, we should be comparatively free from the apple worm. But last fall, as you will remember, the ground under our apple trees, especially in pastures and neglected fields, was covered with fruit; in many places, the apples were not gathered at all, and the apple worms had an opportunity to propagate indefinitely. Consequently, this year, we have wormy and imperfect fruit. To a great extent, we are suffering just from that cause, and if we neglect our fruit at any time, we suffer in consequence of the increased ravages of those insects. Hence I think the plan adopted in Western New York, and Michigan, of putting the sheep and swine into the apple orchards, to pick up the fallen fruit, is an excellent one. Our Secretary, Mr. Gold, has accomplished the same object, by letting his cows into his orchards, nights, until near the time of harvesting his fruit. Mr. Pierce, of Arlington, Mass., picked up the fallen fruit and buried it, which, of course, destroyed the worm, and prevented it from propagating. If we can in any way prevent these insects from propagating, we shall do ourselves a great benefit.

Mr. **Catlin.** I suppose there is a difference in different localities. We had but little fruit last year, and what little we did have was very inferior, while, this year, we have had a super-abundance, and I never saw it nicer.

Mr. **Augur.** That is just the point. In the Naugatuck valley, last year, the orchards were all swept by the tent caterpillar, and before they were half grown they had eaten up the full supply of food, and died of starvation, and, of course, if there were no apples, there were no apple worms. The farmers there suffered last year, but this year, they have been compensated for that loss. I have sometimes thought that we might afford to lose a harvest one year, to secure immunity from the depredations of these insects the next, especially if the full crop came on the odd year.

Mr. MANCHESTER. Do you consider the pear crop surer than the apple in this locality?

Mr. AUGUR. I think it is. There are certain varieties of pears that have not missed a crop for twenty years. You can hardly say that of any apple. The pear has not nearly so many enemies as the apple.

QUESTION. Has not the Flemish Beauty been very free from cracks this last season?

Mr. AUGUR. I can only answer for myself. I think I have had better fruit this year than last.

Mr. ———. Mine was very fine and good this year, and last year I did not have a peck of good pears.

Mr. ———. It is not fit to be recommended for Connecticut.

Mr. GOLD. When it does as well as it did this last year, we should recommend it.

Mr. STEWART. I did not have a pear fit to eat from 1868 until last year, when I had a good many.

Mr. AUGUR. That variety was pretty thoroughly discussed last year, at Chicago, and it was universally condemned as objectionable, in certain localities. In almost every State, it does well in some localities, but as a rule, it does not. I found about St. Joseph, in Michigan, where they had previously planted to a large extent the Flemish Beauty, they almost universally pronounced it an unprofitable pear; and yet I saw some beautiful Flemish Beauty trees there.

QUESTION. Would you recommend the cultivation of Clapp's Favorite, in preference to the Bartlett?

Mr. AUGUR. I do not think that Clapp's Favorite will take the place of the Bartlett. It is an excellent pear, but in my opinion, it is not as good a market fruit as the Bartlett. It is quite tender. It will ripen perfectly, but when it has once reached the point of maturity, it begins to rot very quickly at the core.

QUESTION. Is there any variety you would recommend in preference to the Bartlett?

Mr. AUGUR. I do not think there is any pear that will take the place of the Bartlett, as a market pear, at that season.

QUESTION. If you were going to set out a thousand apple trees for winter fruit, what three varieties would you recommend for the New York market?

Mr. AUGUR. I should say the Baldwin, and Rhode Island Greening, would be two, although in some parts of the State the Rhode Island Greening does not do quite as well as in other localities. I consider it the best apple to raise—safest, surest. The Baldwin, in certain localities, has shown a tendency, within the past few years, to fail; a great many trees have died. There is a drawback in reference to that. In many localities, the Roxbury Russet is a very valuable fruit. In the southeastern part of the State, about Stonington, and Mystic, and even along through the eastern part of the State, up as far as Griswold, I think the Roxbury Russet grows in its perfection. If that were true all over the State, I should certainly include that as one. But there would be a difference of opinion when you began to go further than that, as to which would be the better variety to choose. I think in some localities one variety would do better, in some another. These things can usually be determined by consulting the market, and the character of your own soil.

QUESTION. In regard to the cultivation of the plum. I have a plot of ground behind my barn, where I propose to set plum trees. It is in proximity to the pig-pen and hennery, and I propose to let the occupants loose, and let the pigs root and the hens scratch, as much as they please. What will be the result?

MR. AUGUR. I received a communication, a few days since, from a gentleman in East Greenwich, R. I., stating that he had a large plum orchard in his hen yard (he is quite an extensive poultry raiser), and he states that his plum orchard in his hen yard for the past few years has yielded bountifully; it has been a decided success. I have a hen yard of about an eighth of an acre, in which I propose to set plum trees next spring, and I intend to drench the trees, as a remedy for the curculio, as being a little easier than jarring, and I also think it is a preventive of the black knot. I have very strong confidence that we can raise plums, if we will guard against the black knot and curculio; but to do that, we must make a business of it. If you depend upon jarring the trees, and neglect it for a week, perhaps three-quarters of the plums may be punctured during that week. It is a business that needs to be attended to regularly and thoroughly, until the period of danger has passed. I saw, at St. Joseph, a plum orchard of three-quarters of an acre—the trees were all of the Lombard variety—and there was not a tree that was not loaded beyond its capacity. Very many of the branches were absolutely covered with fruit. It was one of the grandest sights I ever saw. But in order to secure that result, they jarred their trees daily during the curculio season. Mr. John Whittlesey, at St. Joseph, showed me three trees from which he gathered, in 1872, $175 worth of fruit. It seems a large story, but he assured me it was true. The trees were large, and had been very productive. There was a beautiful show of fruit on them when I was there. The way the plums looked at the Pomological Fair at Chicago, and in the orchards around St. Joseph, was certainly calculated to inspire confidence in our ability to grow the plum, if we will take the same measures that they take in order to secure a crop. I noticed that plums were selling in the market for thirty cents a quart, and that is a price that will pay for a little extra care of the fruit.

QUESTION. Is there always an even and odd year with apple trees in bearing?

MR. AUGUR. A great many of the orchards in our State have interchanged from the even year to the odd in consequence of the depredations of the canker worm. That is the case with some orchards in Woodstock and in our town. And again, by the operations of the tent caterpillar, as in Bethany, Waterville, and along the Naugatuck Valley, we find that the bearing year has been changed, as in the case of our friend Mr. Manchester, who has made such a beautiful show of fruit, the product of his orchards in the odd year. I think these accidental circumstances often change the bearing year. Mr. Alexander Hyde, of Lee, Massachusetts, told me that he had a good crop of apples this year from trees that bore well last year. He manures his trees every autumn, and keeps up a good growth continually, and usually gets good crops. A gentleman in Wallingford, from whom I had a communication, a few days since, assured me that he had four successive crops from his orchard, the result of care. But you will all testify, gentlemen, that here in Connecticut, the rule has been to neglect the orchards, and if an old orchard is neglected, if it bears excessively one year, it is too much to expect a crop the next year. The Baldwin apple, particularly, is very likely to bear on alternate years.

QUESTION. Would shaking off the apples in June, tend to ensure a crop the next year?

MR. AUGUR. I think it would, undoubtedly.

Mr. ———. I know a case where a hail storm, passing over an orchard, destroyed the fruit for that year, and changed the bearing year, so that the trees gave a splendid crop another year.

QUESTION. On that theory, could you not make one half of a tree bear fruit one year, and the other half the next, by picking off the fruit from one half of the tree one year, and letting that half bear the next year?

MR. AUGUR. It is a pretty hard matter to make much headway in an orchard by picking off the young fruit by hand. I was told by a gentleman from Hadley, Mass., that a gentleman there, who prided himself on having his orchard of Baldwin apples bear the odd years, finding the trees were gradually coming round to the even years, determined to take one tree and pick off all the fruit. He went to work thinning the fruit, but this gentlemen said that although he picked off a large portion of the fruit, he left enough to make a most beautiful crop of fine, large apples.

QUESTION. Would plowing around the trees in an old orchard be any benefit where it is in turf or meadow ground?

MR. AUGUR. In reference to the matter of plowing and cultivation, I think that if orchards are plowed, they should be plowed very carefully; where an orchard has gone several years without being plowed, and the plow is put in deep, I think it inflicts very great damage by tearing up the roots. But if the work is done carefully, it may be a great benefit to an old orchard, and bring it into bearing condition again. Mr. Robinson, of Hampton, in a communication which he sent to me a few days ago, spoke of his orchard, which bore very fully last year, and said that a portion of the orchard was plowed last year, and that portion bore a fine crop of choice fruit this year; the unplowed portion did not do as well. But in plowing an orchard we should always, I think, be very careful indeed. It will not do to trust an unskillful man to plow an orchard. The plow should run very lightly about the trees. I have an orchard which has not been plowed since 1857, from which I had a handsome crop of fruit this year. It bore well last year. But I have adopted the plan of giving it a dressing of manure every year, spreading it evenly over the ground in the fall. I have continued that as a settled policy, and I believe it should always be done.

Question. Do you use ashes sometimes?

Mr. AUGUR. I do, all I can get. I should use more, if I could get them.

QUESTION. Are they in a pasture?

Mr. AUGUR. Mowing.

QUESTION. What is the age of the trees?

Mr. AUGUR. The trees were set out, I think, about 1852.

Mr.———. I have an old orchard, which was set out forty years ago. It has not been plowed for thirty years. Some three years ago, the bark was very rough, and I took an old hoe, and scraped the trees, and then washed them with old-fashioned lye, plowed the ground, and planted potatoes, and I got a nice crop of fruit.

Mr. AUGUR. I suppose you took care in plowing.

Mr.———. I certainly let the plow run shallow.

Mr. DAY offered the following resolution, which was carried:

Resolved, That in view of the able, thorough, and practical lectures with which we have been favored during our sessions, our thanks are hereby tendered to the gentlemen who have favored us with their essays.

Mr. ROCKWELL presented the following resolution:

Resolved, That the thanks of the Connecticut State Board of Agriculture are due, and are hereby tendered to the press, for the able and courteous manner with which they have heretofore, and do now second every laudable effort of this Board, for the diffusion of practical knowledge in agriculture.

The resolution was adopted.

The following resolution, offered by MR. PENNIMAN, was also adopted:

Resolved, That the hearty thanks of this Board are due, and are hereby tendered to the railroad companies for their courtesy in furnishing return tickets to the members of the Board, and to farmers and others attending this convention.

Mr. WELLS submitted the following resolution, which was passed:

Resolved, That the thanks of the members of the Connecticut Board of Agriculture are due, and are hereby tendered to the citizens of Winsted, for their generous hospitality and politeness.

Mr. GOODMAN. I desire to say one word in behalf of these gentlemen who were invited here to speak to the Board of Agriculture. I may say, in the first place, that we have been highly gratified with the kind manner in which we have been received, not only by the Board of Agriculture, but by the ladies and gentlemen of Winsted. We have had a pleasant and agreeable time. But that is not all we came for, nor all that you came for. It has been peculiarly gratifying to see that the farmers of Connecticut are taking an interest in this business. The establishment and maintenance of the State Board of Agriculture, of Connecticut, has been up-hill work. I have noticed, that whenever the leading men of your State have been assembled, and have referred to agriculture, they have given it the cold shoulder. In the State of Massachusetts, the leading men, the Governors and would-be Governors, the Presidents of Colleges, and men of all ranks, take an interest in agriculture. We have conquered their prejudices. We have established an Agricultural College, and the men of our State are more anxious for a seat at the State Board of Agriculture, than they are to hold any ordinary political office. The State Board there, is composed, as yours is here, of certain members appointed by the Governor, and of the representatives of thirty agricultural societies. They hold their annual meetings and other meetings, in the city of Boston, and they hold winter meetings like this; but I do not know, notwithstanding the large number of societies connected with the Board, that we have a larger number in attendance at those meetings than have attended here, or of men who take any deeper interest in the subject. But one result of there being so many societies, is the diffusion of general agricultural knowledge throughout the State, and it has had the effect, as I have said, to bring in all classes of people, so that they now all work harmoniously, for agriculture and for the State Board.

Now, to establish a Board of Agriculture in this State, on a stable foundation, you need, I apprehend, those same fostering influences. You want to bring to bear upon these meetings, the fostering influences of the State; you want to enlist the men out of agriculture, as well as in it. I apprehend that the only way you can conquer these prejudices is by manifesting the utmost earnestness yourselves.

We know that, as far as agriculture is concerned, there are few questions that can be said to have been absolutely settled. The question, for instance, as to the best method of cultivation is as much discussed to-day as it was in the days of Columella, or perhaps in the days of the Pharaohs. There are some questions connected with agriculture, which seem destined never to be settled. But I trust, that in time, through the experiments and investigations which will be carried on at the Experimental Stations, and the Agricultural Colleges, certain questions will be settled in agriculture; and the best way to settle them, is by means of these Experimental Stations, and through such meetings as you have had here. I apprehend that the men who have attended these meetings, and heard the discussions, have been enlightened upon a great many questions, and I am entirely satisfied that they will be able to carry on their business in a more thorough manner, and upon more scientific principles, than ever before.

Now, the only way of carrying on a farm profitably is by "high farming,"—high modes of cultivation; not only cultivate externally, but cultivate inside. Farmers have the same privileges and rights as other men. They are entitled to the same culture. In cities and large places, there are lines of demarcation, and the people who cultivate vegetables or carry on trades, are not admitted to society on an equality with others. But in the country, where I live, certainly, the farmers and laboring men are on the same footing, occupy the same social position, as others. The man who brings me my bread, the man who makes my shoes, the man who performs any of the ordinary work about a farm, stands in the same social position with me in the club; I may find him my equal and more than my equal, in debate and in general knowledge, as far as that is concerned, we have in the country what is, I believe, found nowhere else, the model republic upon which this country is founded. I trust, therefore, that the farmers of Connecticut will equal those of Massachusetts in upholding their State Board, and in elevating the profession in Connecticut as it ought to be elevated all over New England.

Mr. Rockwell. *Mr. Chairman and Gentlemen of the State Board of Agriculture*:—As a citizen of this borough, town, and county, and in behalf of all the citizens of this borough, town, and county, I thank you most heartily for your visit among us at this time. We thank you for the many valuable hints and suggestions with which you have favored us, which we shall carry to our homes, and which will daily kindle in our minds a hearty and grateful remembrance of this meeting. We are very grateful to each and all of you. And I would say, further, that we shall ever extend to you a hearty welcome when you shall return to us again.

On motion of Mr. Day, the Convention then adjourned, without day.

THE QUESTION BOX.

As announced in the programme, a Question Box was provided for the reception of inquiries in writing, upon any agricultural topic. This was opened at leisure intervals during the three days, and furnished fertile source of material for discussion. Most of those that referred to the regular subjects were presented to the lecturers, and appear in the discussions. The subjoined list contains most of the remaining questions which were answered by the convention, more or less satisfactorily to the inquirers.

QUESTION 1. Should sward land be winter fallowed, or plowed the autumn previous to being planted, and should it be plowed again the next spring before planting or sowing?

2. What is the best, safest, and cheapest explosive material for farmers to use for blasting rocks, and how is the way to use it safely?

3. Is farming, as a general thing, the best business for young men to engage in?

4. Why have the white grubs been so common this season in mowing and pasture, and how may they be destroyed?

5. What is the best method of eradicating the wild carrot from our farms?

6. Is there any remedy against white grub, and what are the best methods of getting the land back into grass?

7. What is the cheapest and most convenient form of farm gate?

8. When and how is the sweet got into the maple, and other trees?

9. What makes a cow slabber?

10. Should dry meal be fed before feeding hay, or after?

11. What is the best method of subduing pasture land that is infested with brakes, when it cannot easily be cultivated?

12. Would not a law, compelling farmers to cut or remove all brush or trees (not including shade trees) from the highways adjoining their lands result in unequal and burdensome taxation?

13. What five varieties of apples are best? What five of pears? What five of peaches? What three of plums? Will it pay to use mineral substances in raising common vegetables?

14. Is burning bushy and braky pastures beneficial, and when is the best time to burn them?

15. What is the best method of destroying Canada thistles?

16. Is broom corn culture profitable in Connecticut?

17. Can a barn, built at a reasonable cost, be made fire proof, so far as the stock confined therein is concerned?

18. Will it pay a farmer to make superphosphate, if he can buy bones for $20 per ton?

19. Is it advisable for the farmers and land-holders of this state to plant forest trees, and if so, of what variety?

20. What is the best mode of exterminating woodchucks?

21. Has the barometer proved sufficiently reliable as a weather indicator, as to be of practical use to the farmer in securing his crops from damage from storms?

22. What is the cause of clump foot in cabbage, and its remedy?

23. Is it right for the farmers of Connecticut to give up sheep for dogs?

24. Does the farmer, according to the hours he labors, receive as much as the mechanic?

25. Which is the best method of raising sweet corn for fodder? Broadcast, in drills, or in hills? Are large or small varieties preferable?

26. What is the safest and surest method of killing lice on cattle?

27. Can we, in the future, raise peaches in Connecticut?

28. Which is the best method of getting rid of the Goshen hardhack?

29. Muck: how can it be managed to make it pay the best? Can lime at $2.50 per barrel, and ashes at 20 cents per bushel, be advantageously composted with it? Should the lime be slacked before applying it? How much lime and ashes to the cord?

30. My pig sickened, refused to eat or be comforted. Tongue not much furred, tail a little. Smith said, "give charcoal," but no hankering for charcoal was manifest. Brown said it was tooth-ache, and we knocked out one that seemed to crowd. The down-cast expression of the animal continued, and Jones recommended bleeding by the excision of the tail. No blood; successive inches were lopped, until there was little or nothing left for subsequent operators; still little blood, and no improvement in the dejected expression of the beast. Eight holes in the legs were then searched for and cleansed. Williams said it would promote a healthier action, but here the pig lay down without much other action of any sort. Peebles now said the case was critical, and advised to cut a small slit between the ears (which had been previously subjected to like treatment with the tail,) and to rub in salt. This promised to be successful, but just at that moment the animal, with characteristic obstinacy, died. My question is, what didn't I do that I should have done, and what should I have done that I didn't, to save that pig?

STATISTICS OF ROADS.

To obtain a knowledge of the length, cost, and condition of the roads and bridges in the state, the circular on pages 204–5 was issued in Oct., 1875, and sent to every town in the state.

Town-Clerks, selectmen, and others, have very generally responded. Yet, it is to be regretted that I have been unable to get any replies from a few towns, after repeated calls.

I have tabulated these replies, and commend them to the study of all those interested in the economical management of our town affairs, as well as in the subject of good roads.

STATISTICS OF ROADS.

Cities and Towns.	Population 1870.	Grand List, 1874.	Miles of Road.	Ann'l Cost.	Cost per mile.	Expense of Bridges.	Large Bridges.	Length of Bridges in feet.	Material of Bridges.	Cost of Bridges.	How Roads Repaired.	Character of Soil.	Nature of Surface.
Andover,	462	263,547	40	$500 to 1,000	$18.75	$100.00	3	25	wood, 2, stone, 1	$250	Contract.	gravelly.	hilly.
Ashford,	1,242	396,874	100	1,800	18.00	....	....	....	....	....	Contract.	stony & hard.	uneven.
Avon,	987	531,622	50	1,500	30.00	....	2, Farmington.	120	wood	5,000	Contract, '75. District, '76.	sandy, gravelly.	hilly.
Barkhamsted,	1,440	497,716	85	1,500	17.77	See communication at close of tables.			....	....	Contract.	....	hilly.
Beacon Falls,	....	357,221	25	700	28.00	150.00	2, Naugatuck.	275, 115	wood, 1 cov.	10,000	Selectmen.	varied.	hilly.
Berlin,	2,438	1,055,333	70	2,000	30.00	750 in '75	1 10	83 35 to 40	iron, 1, rest wood	2,000 1,000	Selectmen.*	Loam, clay.	hill & plain.
Bethany,	1,736	307,298	50	941	18.84	....	....	...	....	....	Selectmen.	varied.	hilly.
Bethel,	2,312	876.007	30	†2,500	81.66	500.00	....	Longest, 30	wood	200	‡	....	hilly.
Bethlehem,	750	506,912	75	1,200	16.00	100.00	None.	....	wood & stone	....	Contract.	light loam.	rolling.
Bloomfield,	1,473	844,671	80	1,700	21.25	600.00	½ 2, Farmingt'n.	200, 250	wood	½ 2, 3,500	Contract.	varied.	undulating.
Bolton,	579	224,357	42	900	22.00	....	None.	....	....	....	Districts.	gravelly loam.	hilly.
Bozrah,	987	616,599	50	1,500	30.00	....	....	....	....	....	Contract.	sand, loam, grav.	hilly.
Branford,	2,489	1,230,415	51	4,000	78.40	....	None.	....	....	....	S. M. or Com.	clay & loam.	uneven.
Bridgeport,	19,876	12,602,700	..	....	....	...	....	....	....	....	....	....	....
Bridgewater,	878	464,597	50	1,100	22.00	....	½ 2, Housatonic.	245, 175	wood	§ 3,786.16 4,226.19	Contract and day labor.	clay loam.	hilly.
Bristol,	3,790	1,822,765	100	5,188	51.88	....	8 large bridges.	90, 80, 64, 54, 50	wood, 4, iron, 4.	3 iron 11,134	Contract under Selectmen.	varied.	hilly.
Brookfield,	1,194	640,898	..	...	....	....	. ...	....	....	....	....	....	....
Brooklyn,	2,355	1,407,073	70	2,100	30.00	...	½ 2, Quin'baug.	138 each	wood	each 2,500	Districts.	black loam, clay, gravel, sand.	hilly.
Burlington,	1,317	401,973	..	1,600	....	150.00	....	....	....	....	Districts.	sandy.	hilly.
Canaan,	1,258	621,044	60	1,300	21.66	184 in '75	½ 2, Housatonic.	130 each	wood	....	Contract.	sand, loam, gravel, muck.	hilly.
Canterbury,	1,552	593,289	80	1,800	22.50	147 in '75	Butts, ½, Canterbury.	B, 165 C, 160	wood	C., 3,000	Districts.	gravelly.	hilly.
Canton,	2,639	1,247,575	100	2,500	25.00	500.00	2, Farmington.	275, 150	pine	4,000 4,500	Districts.	gravel, sand.	hilly.
Chaplin,	704	271,558	50	900	20.00	50.00	5, Pachaug.	80 each	wood	each 400	Contract.	varied.	hilly.
Chatham,	2,771	745,912	90	2,184	24.27	....	½, Salmon.	100	wood	5,200	S. M., con. & la.	varied.	hilly.

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* Selectmen buy cattle, tools, &c., and take care of the roads.

‡ Two highway surveyors. Town own the team and hire men by the week.

† Had about $1,500 extra expense last year from freshet,

§ Besides all mason work.

Cheshire,	2,344	1,303,427	90	2,600	28.88	200.00	4½, Quinnipiac.	32 to 36	wood	each 500	Con. by S. M.	gravelly loam.	hilly.
Chester,	1,094	419,849	54	1,400	41.10	....	....	....	....	....	Road Agent.	gravelly, loam.	hilly.
Clinton,	1,404	631,201	30	....	..	....	....	....	....	....	....	....	....
Colchester,	3,383	1,477,679	125	*3,000	24.00	1,000.00	½, Salmon, Day's bridge.	100 90	wood iron	5,200 4,000	Day labor.	....	. ..
Colebrook,	1,132	542,701	60	1,750	29.17	505.00	2, Farmington.	100	wood	each 1,000	Selectmen.	varied.	hilly.
Columbia,	891	308,617	50	1,500	30.00	100.00	3 equally with Coventry, 1 with Windham.	120 to 50	wood	....	Dis., labor tax.	clay, loam, &c.	hilly.
Cornwall,	1,772	731,302	87	†3,018	34.70	700.00	3, Housatonic, equally with Sharon.	100 120 130	wood, 2, iron 1	iron 2,600	Con. by S. M.	loamy, stony.	hilly.
Coventry,	2,057	782,159	100	2,500	25.00	200.00	½ 5, Hop River, 5 Willimantic.	80 each	wood	average, 200	....	gravelly.	hilly.
Cromwell,	1,857	806,141	36	1,568	43.20	152.00	½ 3, Sebetha.	80 each	iron	total 8,000	Contract.	sand, grav., st'ne	hilly.
Danbury,	8,754	5,509,152	80	10,000	125.00	....	....	....	wood, stone, and iron	....	Selectmen.	sandy.	hilly.
Darien,	1,810	1,632,126	45	1,700	37.77	300.00	....	....	....	....	Districts.	clay & loam.	hilly.
Derby,	8,027	3,689,074	..	7,000	....	....	4, Naugatuck, 1, Housatonic.	....	wood, 4, iron, 1	....	Selectmen.	part sandy.	hilly.
Durham,	1,086	489,442	57	1,400	24.56	....	6	....	wood & stone	....	‡ Districts.	sandy, muck.	hilly.
Eastford,	984	249,812	100	1,000	10.00	....	....	....	....	....	Contract.	....	hilly.
East Granby,	853	517,796	33	1,000	30.00	....	1 & ½ 2, Farmington.	200 each	wood, 2, wood & iron, 1	each 3,000	Selectmen.	east, sandy, west, loam.	east, level, west, hilly.
East Haddam,	2,952	1,263,158	150	4,000	26.66	....	½, Salmon.	150	stone, 2	....	Selectmen.	sandy loam.	hilly.
East Hartford,	3,013	1,697,691	..	....	....	....	....	....	....	....	....	. ...	....
East Haven,	2,713	2,108,539	26	2,000	77.00	500.00	Fair Haven, ½, Quinnipiac.	400	stone & iron	90,000	Selectmen.	sand, loam.	uneven.
East Lyme,	1,506	489,250	..	...	....	....	....	....	....	....	....	....	...
Easton,	1,289	522,164	..	....	....	....	....	....	....	....	....	....	....
East Windsor,	2,882	1,249,672	75	4,200	56.00	1,000.00	5, Scantic.	50 each	wood, 4, iron, 1	each 500 iron 3,000	Districts.	sand, clay, gravel.	level.
Ellington,	1,452	746,201	80	2,100	26.00	....	....	Average 30	wood	....	By the day.	sandy.	hilly.
Enfield,	6,322	2,510,992	..	....	....	....	....	....	....	....	....	....	....
Essex,	1,664	1,090,275	30	1,500	....	....	....	....	....	....	....	light loam.	hilly.
Fairfield,	5,642	2,772,506	..	....	....	....	....	....	....	....	....	....	....
Farmington,	2,617	1,818,738	120	1,600	12.50	100.00	3 covered, Farmington, 2, Pequabuc.	3 150 each	wood	4 to 6,000	Town team and men.	various.	hill & plain.
Franklin,	731	391,796	30	750	25.00	250.00	1 Yantic.	150	wood	2,400	Districts.	gravelly loam.	hilly.
Glastonbury,	3,560	1,192,728	..	....	....	....	....	....	....	....	....	....	....
Goshen,	1,224	795,949	78	2,364	30.00	....	None.	....	....	....	Contract.	black loam, clay.	undulating.

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* Twenty thousand dollars expended on roads in two years.

† Average for three years on roads and bridges, not including new iron bridge, and $352 for new road and grading.

‡ Two surveyors in each school district keep in repair.

STATISTICS OF ROADS (CONTINUED).

Cities and Towns.	Population 1870.	Grand List, 1874.	Miles of Road.	Ann'l Cost.	Cost per Mile.	Expense of Bridges.	Large Bridges.	Length of Bridges in feet.	Material of Bridges.	Cost of Bridges.	How Roads Repaired.	Character of Soil.	Nature of Surface.
Granby,	1,516	528,340	100	1,900	19.00	450.00	None.	....	....	....	Contract.	various.	level, hilly.
Greenwich,	7,672	3,708,539	130	10,000	75.00	800.00	2, Mianus, 1 Byram.	200, 100 75	wood	....	Contract.	various.	hilly.
Griswold,	2,576	1,265,105	65	2,800	43.00	1,000.00	1 Quinnebaug.	200	wood	4,000	....	....	....
Groton,	5,119	2,087,504	70	2,750	39.28	120.00	½, Mystic.	264	mostly iron	total, 15,000	Districts.	various.	part hilly.
Guilford,	2,576	1,460,752	100	5,724	57.24	....	Jones'.	40	wood	503	Commissioners.	gravelly.	part level.
Haddam,	2,073	771,768	112	2,500	22.00	....	½, Leesville.	....	wood	....	Contract.	....	....
Hamden,	3,028	1,646,963	..	....	....	....	....	....	....	....	....	....	....
Hampton,	891	438,798	60	1,200	20.00	75.00	None.	....	wood	....	Contract.	r'ky, grav., sand.	hilly.
Hartford,	37,825	45,672,895	C. 85 T. 10	50,000	527.00	See comm	unication.	....	....	....	City and Town workmen.	clay & sand.	undulating.
Hartland,	789	286,264	70	1,400	20.00	50.00	3, east branch of Farmington.	50 each	wood	each 800	Contract.	gravelly loam.	hilly.
Harwinton,	1,045	512,495	95	1,800	18.00	100.00	½ 4, Naugatuck.	80 to 100	wood	700 to 1,000	Contract.	loam & gravel.	hilly.
Hebron,	1,285	526,763	74	1,300	17.56	60.00	None over 20 ft.	....	wood & stone	....	Contract.	stony.	hilly.
Huntington,	1,527	972,974	..	....	....	....	....	....	....	....	....	....	....
Kent,	1,744	538,381	100	2,500	25.00	400.00	2, Housatonic.	200, 80	oak chestnut	1, 600 1, 2,000	Contract.	sandy loam.	mountain's.
Killingly,	5,712	2,094,387	..	....	....	....	....	....	....	....	....	....	....
Killingworth,	856	246,222	110	1,608	14.31	124.57	. ....	50	wood	3 to 500	District.	loam.	hilly.
Lebanon,	2,211	1,170,554	175	3,250	18.57	....	None.	....	wood	....	District, labor.	varied.	hilly.
Ledyard,	1,392	537,721	100	1,344	13.44	....	1 draw bridge jointly with Preston.	500	wood	4,000	Districts.	black loam.	hilly & st'ny
Lisbon,	503	299,253	48	600	12.00	....	½, Quinnebaug, ½, Shetucket.	Total 390	wood	wood, 3,500 m'nry, 4,000	Selectmen.	e., sandy loam, w., clay.	hilly.
Litchfield,	3,113	1,861,425	..	....	....	....	....	....	....	....	....	....	....
Lyme,	1,179	319,576	..	....	....	....	....	....	....	....	....	....	....
Madison,	1,814	879,096	93	1,400	15.00	....	None.	....	wood	....	District.	loam, sand.	hilly, roll'g.
Manchester,	4,236	2,122,606	80	3,825	47.81	*3,226.00	5, Hockanum.	50 to 75	wood	20,000	Con. by day.	sand, loam.	rolling.
Mansfield,	2,402	732,662	100	2,500	25.00	1,000.00	5, Willimantic, ½ 2 with Coventry.	80 to 120	wood	2 each 3,300	Dis. Surveyors.	varied.	uneven.
Marlborough,	473	151,813	..	....	....	....	....	....	....	....	....	....	....

Unusually large in 1875, one or two new bridges.

Meriden,	10,521	7,810,988	..	....	....	....	....	....	....	....	....	....	....
Middlebury,	696	377,865	55	1,100	20.00	50.00	None.	....	stone & wood	stone, 150	Contract.	stone, gravel.	hilly.
Middlefield,	1,054	553,852	36	1,031	30.00	356.67	4½	50 each	wood	7,000	S. M. by Dist.	heavy loam.	hilly.
Middletown,	11,143	9,099,155	T. 126	7,964	63.20	1,522.00	12	40 to 110, 200	See communication.		Day labor under Commissioners.	wet, clayey.	hilly.
			C. 20	3,736	186.82	Maintained by town.							
Milford,	3,407	1,120,289	..	3,000	....	....	* Washington on Housatonic, Others.	 50	wood	w., 18,000	Districts.	heavy loam.	varied.
Monroe,	1,226	534,915	75	1,360	18.14	....	None.	....	....	....	Contract.	....	hilly.
Montville,	2,496	1,180,442	100	3,000	30.00	....	3 arched	30 & under.	wood & stone	1,800 450 2,400	Day labor under Selectmen.	varied.	hilly.
Morris,	701	376,939	40	608	15.20	60.00	3	34, 33, 26	wood	1, 300; 1, 100	Contract.	loam & clay.	hilly.
Naugatuck,	2,830	1,402,487	..	2,500	....	1,200 in '75	2	250 each	wood	....	Dist. & Con.	....	hilly.
New Britain,	9,480	4,562,721	..	....	....	....	None.	....	....	....	....	varied.	undulating.
New Canaan,	2,496	1,286,254	100	2,500	25.00	....	None.	....	....	....	Selectmen.	loam & gravel.	hilly.
New Fairfield,	871	461,314	..	....	....	....	....	....	....	....	....	....	....
New Hartford,	3,078	1,114,401	75	....	....	....	3, Farmington.	....	....	....	Contract.	gravelly.	hilly.
N. Haven (city),	50,886	56,045,539	120	†10000	83.33	3,070.00	½, Quinnipiac.	....	wood & iron	....	Department.	sandy.	level.
Newington,	....	486,992	..	....	....	....	....	....	....	....	....	....	....
New London,	9,580	6,495,832	..	....	....	....	....	....	....	....	....	....	....
New Milford,	3,586	2,114,954	..	....	....	....	....	....	....	....	....	....	....
Newtown,	3,683	1,874,136	‡177	4,114	24.10	1.123.00	None.	....	wood & stone	....	Contract, 3 yrs.	varied.	hilly.
Norfolk,*	1,641	723,787	80	2,200	27.50	....	None.	....	....	....	District.	sand & loam.	hilly.
No. Branford,	1,035	509,419	70	1,800	25.00	250.00	None.	....	....	....	Districts.	varied.	hilly.
No. Canaan,	1,695	729,021	75	1,700	22.64	....	½ 1, Housatonic.	120	wood	....	Selectmen.	varied.	hilly.
No. Haven,	1,771	756,204	45	1,500	33.33	30.00	Mansfield on Quinnipiac, 2, Mill River.	165	iron	4,000	Districts.	sandy.	hilly.
No. Stonington,	1,759	780,364	100	2,000	¶20.00	150.00	½ Boon on Pawcatuck.	....	wood on stone piers	....	Districts.	gravelly loam.	hilly.
Norwalk,	12,122	6,848,823	..	6,500	....	1,000.00	1 draw bridge.	900	wood	4,000	Districts.	gravel & loam.	hilly.
Norwich,	16,653	15,283,447	150	'36,798	245.32	....	‖	312	iron & wood	....	By Town.	sand & loam.	hilly.
Old Lyme,	1,362	500,499	35	1,200	34.28	150.00	1, Block Hall, 2 Lieutenants.	About 100	wood	....	Contract.	loam & gravel.	hilly.
Old Saybrook,	1,215	630,375	40	740	18.00	....	....	....	....	....	Labor tax.	sand & loam.	rolling.
Orange,	2,633	1,792,445	..	....	....	....	....	....	....	....	....	....	....
Oxford,	1,338	442,845	75	1,953	¶30.00	176.68	....	....	....	....	Contract, 3 yrs.	sand & clay.	hilly.
Plainfield,	4,521	2,120,229	..	....	....	....	....	....	....	....	....	....	....
Plainville,	1,435	838,814	25	1.000	40.00	....	1, Pequabuck.	75	wood, cov.	3,000	Selectmen.	sandy loam.	level.

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* Toll bridge. † Besides cost of repairs, there is turnpiking, paving, setting hydrants, cleaning streets, &c., all under the charge of the department.

‡ 7 miles turnpike, Bridgeport & Newtown T. Co. Bennett's bridge over the Housatonic. The county line is a toll bridge.

§ Poor roads at that. ‖ Partially bridge between Norwich and Preston, others smaller. ¶ Some not worked.

STATISTICS OF ROADS (CONTINUED).

Cities and Towns.	Population 1870.	Grand List, 1874.	Miles of Road.	Ann'l Cost.	Cost per Mile.	Expense of Bridges,	Large Bridges.	Length of Bridges in feet.	Materials of Bridges.	Cost of Bridges.	How Roads Repaired.	Character of Soil.	Nature of Surface.
Plymouth,	4,149	2,127,753	..	....	....	....	....	....	....	....	....	....	....
Pomfret,	1,488	826,475	100	2,800	28.00	500.00	½, Quinnebaug, 10 smaller.	125 Average 22	wood	*2,500 oth., ea., 75	Contract, 3 yrs.	clay, gravel.	hilly.
Portland,	4,694	2,380,658	59	1,600	27.12	....	None.	....	....	....	Contract, 5 yrs.	....	hilly.
Preston,	2,162	852,542	..	....	....	....	....	....	... .	....	.... ..	....	...
Prospect,	551	192,940	..	....	....	....	....	....	....	....	....	....	....
Putnam,	4,192	1,841,876	60	3,500	58.33	....	....	2, 80: 1, 250	wood	10,000	By Town.	sandy.	hilly.
Reading,	1,620	997,475	35	3,000	85.71	....	None.	....	....	....	Con. & by day.	....	hilly.
Ridgefield,	1,910	1,254,091	100	2,500	25.00	....	None.	....	....	....	Districts.	varied.	hilly.
Rocky Hill,	1,012	393,164	35	700	20.00	100.00	None.	....	....	1, 800	Contract.	sandstone.	undulating.
Roxbury,	920	520,950	60	1,200	20.00	65.00	4, Shepaug, 1, Jack's Brook.	Average 71, Total 357	wood	3,000	Road Agent.	....	hilly.
Salem,	718	344,140	30	900	30.00	50.00	None.	....	....	....	Contract.	loam & sand.	hilly.
Salisbury,	3,305	2,153,097	92	2,200	22.00	600.00	½ 3, Housatonic, 16 smaller.	100 each 12 and over.	wood, iron,2; stone,2	3,000 to 75	Days works under Agent.	loam & clay.	roll'g, hilly.
Saybrook,	1,267	742,740	33	....	....	....	....	....	....	....	....	....	....
Scotland,	648	409,745	40	800	20.00	....	None.	....	....	....	Districts.	gravelly loam.	hilly.
Seymour,	2,123	857,326	60	1,750	29.16	500.—	2, Naugatuck, 1, Little River.	130, 200 70	wood	2,000 6,000 600	Selectmen.	gravelly.	very hilly.
Sharon,	2,446	1,429,466	125	4,911	39.30	....	½ 3, Housatonic.	100, 120, 130	wood, 2, iron, 1	iron 2,600	....	loamy.	hilly.
Sherman,	848	364,732	..	....	.. .	....	....	....	....	....	....	....	....
Simsbury,	2,051	1,019,184	..	....	.	....	....	....	....	....	....	....	....
Somers,	1,248	654,867	100	1,500	15.00	....	....	Longest 65	stone, 1	2,650	Day labor.	varied.	level, hilly.
Southbury,	1,319	708,877	90	†2,716	30.18	...	....	Longest 100	wood	....	....	loam & clay.	hill & vall'y.
Southington,	4,316	2,114,766	150	4,800	33.00	....	None.	....	....	....	Contract.	sand & gravel.	rolling.
South Windsor,	1,693	1,383,258	60	3,600	60.00	....	1, Scantic, 4, Podunk.	60 30, 36, 40	iron wood	3,000 9 to 1,500	Selectmen.	sandy loam.	level.
Sprague,	3,462	1,315,112	30	1,200	40.00	515.00	1, Shetucket.	200	wood & iron	....	Selectmen.	varied.	hilly.
Stafford,	3,405	1,201,990	..	7,503	....	....	....	....	iron, wood, & stone	....	Contract.	cob. st'ne, loam.	hilly.
Stamford,	9,738	7,761,513	95	9,250	97.50	3,500.00	.. ....	Longest 100	stone, 1, wood	stone, 2,800 w., ea., 800	Districts under Selectmen.	loam, stony.	hilly.

* Besides mason work.

† Average, 6 years.

Sterling,	1,022	353,693	70	1,400	20.00	350.00	....	Longest 80	chestnut.	1,000	District.	varied, wet.	hilly.
Stonington,	6,320	5,512,684	70	4,275	61.00	....	½, Mystic, ½, Pawcatuc, ½, Stillmanville.	180 120 50	iron frame wood	25,000 2,800 1,000	Districts under Selectmen and roadworks.	gravelly loam.	hilly.
Stratford,	3,032	1,805,560	95	1,850	19.00	200.00	1 between Bridgeport & S.	200	wood	....	Commissioners.	gravelly.	level.
Suffield,	3,277	2,186,898	50	6,000	120.00	....	5 or 6, Stony b'k	75 to 100	wood	... .	Selectmen.	sand, clay, grav.	level.
Thompson,	3,804	1,629,495	99	3,000	31.13	....	6, Quinnebaug, 7, French.	50 to 70	wood & iron	500 to 2,000	Districts and Selectmen.	varied, clayey.	hilly.
Tolland,	1,218	375,461	110	2,000	19.00	200.00	½ 4, Willimantic.	90 each	wood	each 800	Contract, 5 yrs.	stony, wet.	hilly.
Torrington,	2,896	1,447,457	109	2,750	25.00	....	None.	....	wood	....	Selectmen.	stony.	hilly.
Trumbull,	1,335	632,072	..	....	....	....	....	....	....	....	....	....	...
Union,	627	258,253	60	1,316	22.00	....	None.	....	... .	....	Contract, 5 yrs.	hard.	hilly.
Vernon,	5,447	2,575,098	80	5,484	68.50	1,000.00	None.	....	....	....	Labor by S. M.	gravelly loam.	hilly.
Voluntown,	1,052	231,074	50	1,100	22.00	....	None.	....	....	....	Districts.	wet, sandy.	level.
Wallingford,	3,676	2,362,833	134	3,350	25.00	500.00	4, Quinnipiac.	1, 188; 1, 100	iron,3; wood,1	1, 5,000 3, each 3,300	Contract.	gravel, loam, & sand.	level.
Warren,	673	269,435	70	1,400	20.00	50.00	None.	Longest 20	wood	850	Contract.	loam.	hilly.
Washington,	1,563	971,122	100	2,500	25.00	....	8½, Shepaug.	60 to 80	wood	300 to 850	Con. & day la.	....	hilly.
Waterbury,	13,148	7,568,849	C. 35 175	*13000 3,500	371.14 20.00	....	Not reported.	....	....	....	....	....	....
Waterford,	2,589	922,784	72	3,500	48.00	....	....	Longest 33	wood	....	Districts.	clay, gravel.	hilly.
Watertown,	1,690	1,555,120	..	....	....	....	....	....	....	....	....	....	....
Westbrook,	987	516,484	33	1,000	30.00	200.00	None.	....	....	....	Town Survey'r.	loam & sand.	hilly.
West Hartford,	1,533	1,727,747	65	8,000	123.00	....	None.	....	....	....	Selectmen.	clay, loam, grav.	rolling.
Weston,	1,054	524,171	54	1,126	20.67	412.85	7 & ½ 3.	24 each	wood	250 to 300	Contract.	loamy.	hilly.
Westport,	3,364	2,406,563	25	1,676	67.00	410.00	6 & ½ 2, Sauga'c.	20 to 25	white oak	280 to 300	Contract.	sand loam, clay.	hilly.
Wethersfield,	2,694	1,149,040	36+	†1,476	40.00	....	5 arched.	...	Portl'd stone	4,850	Selectmen.	sand loam, grav.	rolling.
Willington,	942	309,619	100	1,500	15.00	....	½ 5, Willim'ntic.	40 to 80	wood, 4 cov.	cov. ea. 1,000	Con. & day la.	gravelly loam.	very hilly.
Wilton,	1,995	700,714	..	....	....	....	....	....	....	....	....	....	. .
Winchester,	4,102	2.851,924	77	6,000	77.00	600.00	....	54	wood iron,1; stone,1	‡ iron, 3,000 stone, 1,500	Con. & day la.	gravel & loam	hilly.
Windham,	5,413	3,120,687	..	...	....	....	....	....	....	....	....	....	....
Windsor,	2,784	1,432,320	80	2,000	25.00	....	2, Farmington.	200 to 250	iron, 1, wood, 1	10 or 11,000	Districts.	sand, loam, grav.	level.
Windsor Locks,	2,154	638,746	..	....	....	. ..	....	....	....	....	. ....	....	....
Wolcott,	491	236,545	70	1,000	15.00	....	None.	. ..	....	....	Contract.	loam & gravel.	hilly.
Woodbridge,	830	475,876	55	1,400	25.45	100.00	None over 50.	....	wood & stone	....	Contract, 5 yrs.	gravel, clay, hardpan.	hilly.
Woodbury,	1,931	1,188,503	..	....	....	....	....	....	... .	....	....	....	....
Woodstock,	2,955	1,119,107	150	4,000	26.66	....	None.	....	wood	....	District, money tax divided.	loam	rolling.

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* Including $7,000 for new work. † 6 not worked. ‡ 54 feet span, 20 feet drive way, and two sidewalks.

STATISTICS OF ROADS (CONTINUED).

Cities and Towns.	Materials used.	In bad places.	Width of path in feet.	Width of highway by rods.	Tools or machines	Relative condition of roads.	Are cattle allowed on highways?	Means used to utilize land.	Shade or fruit trees.	Remarks.
Andover,	gravel, roadside.	gravel.	10–18	2–4	mud scra, rut scra	improving.	no.	none.	very few.	1 y'r, day la'r, un'r Sel'n $1000 1 y'r, contract, $500.
Ashford,	....	....	....	....	....	....	no.	....	....	....
Avon,	dirt, roadside.	stone and gravel.	20	3	plow and scraper.	neither.	no.	none.	limited.	cheap as pos'ble to be passa'le
Barkhamsted,	....	....	....	....	....	....	....	....	....	....
Beacon Falls,	gravel.	....	10	3	....	improving.	no.	....	considerable.	....
Berlin,	dirt, roadside.	stone and gravel.	12	2–8 av. 3½	plow and scraper, long side best.	improving.	no.	none.	shade trees.	see com. at close.
Bethany,	....	....	....	....	....	....	yes.	....	....	....
Bethel,	gravel.	filling with gravel	20	2–3	plow and scraper.	improving.	no.	....	very few.	see com.
Bethlehem,	soil.	have none.	15	3–6	plow and scraper.	deteriorating.	*	see com.	....	....
Bloomfield,	soil.	stone and gravel.	12–16	4	road scraper with carriage.	....	no.	none.	moderate.	....
Bolton,	earth.	stone.	16–40	2–6	rut scraper.	deteriorating.	no.	none.	very little.	....
Bozrah,	dirt, roadside.	stone and gravel.	....	4½	patent scraper.	little improve't	no.	none.	no extent.	....
Branford,	gravel, rock gravel	cedar brush, gra'l.	....	2–4	....	improving.	no.	none.	....	....
Bridgeport,	....	....	....	....	....	....	....	....	....	....
Bridgewater,	soil, roadside.	timber and stone.	10–20	3–6	plow and scraper.	neither.	yes.	pasturing.	very limited.	impossible to satisfy all.
Bristol,	soil.	stone and gravel.	10–30	2–4	plow, scra., harrow	improving.	no.	none.	general in centre.	see com.
Brookfield,	....	....	....	....	....	....	....	....	....	....
Brooklyn,	roadside earth.	sand and gravel.	25	2½–3	scraper.	improving.	no.	none.	....	....
Burlington,	loam.	sand, loam, stone.	9	4	plow and scraper.	improving.	no.	gro'n brush	very few.	....
Canaan,	roadside earth.	sand and gravel.	14	4	....	improving.	yes.	none.	very small.	see com.
Canterbury,	roadside soil.	....	10	4	....	neither.	no.	....	....	....
Canton,	gravel and loam.	gravel.	10–20	3–6	plow and scraper.	improving.	no.	....	very few.	....
Chaplin,	gravel earth.	gravel.	20	3–4	patent scraper, &c	improving.	no.	none.	none.	....
Chatham,	roadside earth.	stone and earth.	8–10	2–4	....	no great impro't	yes.	....	some extent.	see com.
Cheshire,	roadside earth.	filling in earth.	16–24	2–4	plow and scraper.	improved.	no.	brush, wee's	some extent.	see com.
Chester,	soil.	stone quarrychips	25–30	2–4	....	improving.	no.	none.	many shade trees.	4 miles turnpike.
Clinton,	....	....	....	....	....	....	....	....	....	....
Colchester,	gravel, if access'le	stone and gravel.	12–20	4	heavy scraper.	improving.	no.	none.	some near village.	see com.
Colebrook,	dirt, loose stones.	....	10–12	3–4	....	deteriorating.	no.	mow grass.	very few.	see com.
Columbia,	roadside earth.	stone and gravel.	10–20	2–4	road scra. or shov.	improving.	no.	bush's & gr	very few.	see com.

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* We vote to restrain them but it is not complied with.

Cornwall,	roadside earth.	stone and gravel.	8-16	2-4	com. & la'ge scra.	improving.	no.	little done.	some extent.	....
Coventry,	gravel and loam.	gravel.	12-20	3	*	improving.	no.	little done.	very limited.	....
Cromwell,	gravel and stone.	stone and gravel.	....	2-8	ox scraper, &c.	improving.	no.	none.	none.	no toll gate, H'd & S'yb'k turn
Danbury,	gravel and loam.	gravel.	20-40	2-4	....	improving.	no.	none.	not great.	see com.
Darien,	roadside.	bedding cobbles.	15-25	3-4	plow and scraper.	improving.	no.	none.	not great.	....
Derby,	....	earth.	....	3	....	improving.	no.	none.	general.	....
Durham,	earth, sand, stone	stones, tin scraps.	12-18	4	no special tools.	not improving.	no.	cows & hor's	not to any extent	except in village.
Eastford,	loam and gravel.	gravel.	10-15	3	Brooks scra. Staf.	deteriorating.	no.	none.	limited, ex. in vil.	see com.
East Granby,	roadside.	stone and gravel.	12-50	4	Chicago scraper.	improving.	no.	none.	no uniformity.	see com.
East Haddam,	roadside.	gravel, stone.	15-20	3-6	ox shovel & plow.	improving.	no.	....	some extent.	....
East Hartford,	....	....	....	....	....	....	....	....	....	....
East Haven,	gravel and shells.	sand, shells, stone	25	2-4	plow, har. l'g scra.	improving.	no.	turfing.	one-tenth planted	turnpiked in spring will stand
East Lyme,	....	....	....	....	....	....	....	....	....	....
Easton,	....	....	....	....	....	....	....	....	....	....
East Windsor,	gravel.	gravel.	10	3	scrapers.	improving.	some.	gr & bush's	no great extent.	....
Ellington,	soil and gravel.	gravel.	....	†3	wide scrapers.	improving.	no.	not much.	considerable.	....
Enfield,	....	....	....	....	....	improving.	no.	none.	some extent.	....
Essex,	loam and gravel.	....	20	1-5	....	....	....	....	....	....
Fairfield,	....	....	....	....	....	....	....	....	....	....
Farmington,	gravel, hardpan.	stone and gravel.	12-16	3	light scrapers.	improving.	no.	cut weeds.	very seldom.	....
Franklin,	gravel and loam.	gravel.	25	3	ox scrapers, &c.	neither.	no.	....	to some extent.	see com.
Glastonbury,	....	....	....	....	....	....	....	....	....	....
Goshen,	roadside earth.	....	18-16	4	Dudley's diagonal scrapers.	....	no.	....	only in villages.	....
Granby,	earth.	earth and stone.	15	3	plow and scraper.	neither.	some.	....	not extensively.	....
Greenwich,	stone and earth.	stone.	16-18	3	scrapers, &c.	improving.	some.	some mow	consider'e of both	gradual improvement.
Griswold,	....	....	....	....	....	....	....	....	....	....
Groton,	loam and gravel.	stone and gravel.	16-50	2-4	plow and ox shov.	improving.	no.	very little.	limited extent.	....
Guilford,	earth.	stone ‖	....	3	plow and scraper.	improving.	no.	....	only in village.	....
Haddam,	....	gravel.	12	3-6	....	improving.	no.	....	not much.	turnpike ten miles.
Hamden,	....	....	....	....	....	....	....	....	....	....
Hampton,	roadside earth.	small stones.	15-20	3	Brooks scraper.	improving.	no.	....	but few.	....
Hartford,	‡	macadamized.	40-60	abot'3	steam roller.	improving.	no.	none.	....	see com.
Hartland,	roadside soil.	stone and earth.	10	2-6	plow and scraper.	stationary.	no.	very little.	not much.	....
Harwinton,	earth.	gravel and earth.	12-14	3-5	plow, scraper, &c.	improving.	no.	mown & fed	very limited.	see com.
Hebron,	roadside earth.	gravel.	12	4	....	§deteriorating.	no.	some mow.	limited.	see com.
Huntington,	....	....	....	....	....	....	....	....	....	....
Kent.	gravel.	furnace cinders.	14	3	patent scraper.	deteriorating.	yes.	none.	none planted.	....
Killingly,	....	....	....	....	....	....	....	....	....	....
Killingworth,	soil.	stone and bogs.	16	4	plow and scraper.	improving.	some.	none.	no great extent.	....
Lebanon,	roadside earth.	small stones, grav.	12	....	plows, &c.	neither.	some.	....	....	....
Ledyard,	gravel and dirt.	gravel and dirt.	16	2-4	iron bars, &c.	not improving.	no.	none.	seldom.	see com.
Lisbon,	roadside soil.	....	20	2-4	....	improving.	no.	none.	very few.	....

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* Patent road scraper and tool carriage combined. † Meant to be 3 rods but much has been fenced in. ‡ Gravel in the outskirts. In the city macadamized with trap rock. ‖ 1½ miles macadamized. § Now letting roads on stronger contract and hope they will improve.

STATISTICS OF ROADS (CONTINUED.)

Cities and towns.	Materials used.	In bad places.	Width of path in feet.	Width of highway by rods.	Tools or machines	Relative condition of roads.	Are cattle allowed on highways?	Means used to utilize land.	Shade or fruit trees.	Remarks.
Litchfield,	....	....	....	....	....	....	....	....	....	see com.
Lyme,	....	....	....	....	....	....	....	....	....	....
Madison,	loam.	....	16	4	....	neither.	no.	none.	200 shade trees.	....
Manchester,	turf, loam, & gutter scrapings.	stone.	15–25	4–8	steel shod wooden scrapers.	improving.	no.	some mow.	no great extent.	.... see com.
Mansfield,	roadside earth.	stone and gravel.	12–16	2–3	Brooks side scra.	neither.	no.	some mow.	few planted.	see com.
Marlborough,	....	....	....	....	....	....	....	....	....	....
Meriden,	....	....	....	....	....	....	....	....	....	....
Middlebury,	gravel.	stone and gravel.	16	3	scraper, &c.	....	no.	none.	very sparingly.	*
Middlefield,	earth.	stone and earth.	16–25	3–4	iron & wood scra.	some improve't	some.	some mow.	increasing.	†
Middletown,	earth and gravel.	stone and gravel.	c19–87 t12–30	33 125f 3–5r	plank scraper.	improving.	some.	none.	generally in city.	Mid'wn is called Forest City.
Milford,	loam and gravel.	loam and gravel.	....	1–5	scraper, &c.	improving.	some.	none.	only near dwelli's	....
Monroe,	roadside soil.	stone and gravel.	13–16	2–4	....	improving.	no.	some mow.	limited.	....
Montville,	gravel.	stone and gravel.	16–24	2–3	Brooks scra. Staf.	improving.	....	....	....	see com.
Morris,	roadside earth.	not very bad.	14	3–4	....	improving.	some.	fruit trees.	to some extent.	....
Naugatuck,	gravel.	....	5–20	....	....	improving.	no.	none.	none.	....
New Britain,	earth, gravel.	have none.	20	3–4	ox scraper.	deteriorating.	no.	mow weeds	not regularly.	too many roads for the money
New Canaan,	soil and gravel.	stone and gravel.	all widths		Farmers tools.	improving.	no.	not much.	moderately.	....
New Fairfield,	....	....	....	....	....	....	....	...	....	....
New Hartford,	gravel mostly.	....	....	4	....	improving.	no.	none.	very limited.	....
New Haven,	stone, gravel.	....	....	1–6	steam roller,	improving.	no.	none.	many shade trees.	....
Newington,	....	....	....	....	....	....	....	....	....	....
New London,	....	....	....	....	....	....	....	....	....	....
New Milford,	....	....	....	....	....	....	....	....	....	....
Newtown,	roadside.	gravel.	8–15	3	plow, scra., har'w	little change.	yes.	none.	only near dwelli's	....
Norfolk,	roadside.	stone and brush.	16	3–4	plow and scraper.	improving.	yes.	none.	some extent.	....
North Branford,	stone, gravel.	stone, gravel.	....	3	....	....	yes.	pasturage.	considerable ext't	....
North Canaan,	earth.	....	....	3–6	plow, scraper.	neither.	no.	none.	very limited.	....
North Haven,	oys. shells, red r'k	shells.	12–15	2–3	plow and scraper.	neither.	no.	none.	sparingly.	....
No. Stonington,	soil.	gravel and stone.	....	1–3	scrapers.	deteriorating.	no.	plant'g tre's	small extent.	....
Norwalk,	gravel.	gravel.	14	2–3	....	neither.	no.	....	....	....

* Men who repair claim improving. Men who use claim deteriorating. † We need better drainage, fewer bars and easier grades.

Norwich,	sand, gravel.	gravel.	....	1–2	....	improving.	no.	none.	very little.	....
Old Lyme,	soil, sand.	stone, earth.	10–30	2–6	....	neither.	yes.	very little.	small extent.	....
Old Saybrook,	gravel, loam.	stone, earth.	24	1½–8	....	improving.	no.	....	not generally	except in principal streets.
Orange,	....	....	....	....	....	....	....	....	....	....
Oxford,	roadside.	....	8–10	3–4	....	neither.	some.	....	small extent.	see com.
Plainfield,	....	....	....	....	....	....	....	....	....	....
Plainville,	soil.	....	25–30	3	plow & diag. scra.	improving.	no.	none.	many in village.	....
Plymouth,	....	....	....	....	....	....	....	....	....	....
Pomfret,	soil.	small stones.	10-15	2½–4	scraper.	neither.	no.	see com.	....	....
Portland,	earth, stone.	stone.	....	2–24	....	improving.	no.	none.	very few ex M'n st	....
Preston,	....	....	....	....	....	....	....	....	....	....
Prospect,	....	....	....	....	....	....	....	....	....	....
Putnam,	sand, gravel.	....	20	2–3	improved scraper.	improving.	no.	none.	no great extent.	....
Redding,	roadside.	cob. stones, grav'l	12	3	....	improving.	no.	none.	limited.	....
Ridgefield,	roadside.	stone, gravel.	16–40	2–7	....	improving.	no.	none.	very limited.	....
Rocky Hill,	earth, 1 m. mcad.	stone.	30	2½–6	....	imdroving.	no.	some mow.	largely.	....
Roxbury,	earth and stone.	earth, stone.	....	1–6	plow and scraper.	improving.	no.	none.	only near dwelli's	....
Salem,	roadside.	....	10–15	3–4	scraper.	improving.	some.	none.	limited.	....
Salisbury,	roadside.	stone, gravel.	12-24	2–8	plank scraper.	improving.	yes.	a few mown	one or two miles.	see com.
Saybrook,	roadside.	....	12–20	2–5	....	neither.	no.	....	....	....
Scotland,	roadside.	....	12–20	2–5	....	neither.	no.	limited.	limited.	....
Seymour,	earth.	cinders.	....	2–4	....	neither.	yes.	....	very limited.	see com.
Sharon,	roadside.	....	8–20	....	....	....	*yes.	none.	....	....
Sherman,	....	....	....	....	....	....	....	....	....	....
Simsbury,	....	....	....	....	....	....	....	....	....	....
Somers,	earth.	....	16–24	2–6	....	improving.	no.	mowing.	none.	....
Southbury,	roadside.	stone, gravel.	....	1–8	plow, scraper.	neither.	some.	none.	none.	see com.
Southington,	gravel.	gravel.	25	1–4	plow, scraper.	improving.	no.	none.	very limited.	....
South Windsor,	roadside.	gravel.	15–80	2–6	scrapers,	improving.	no.	pile wood.	shade trees larg'y	....
Sprague,	loam, gravel.	have none.	12	2	hoe, shovel.	improving.	some.	none.	limited.	....
Stafford,	gravel.	gravel, stone.	14	3–16	Brooks scraper.	improving.	no.	some mow.	increasing.	....
Stamford,	gravel, loam.	stone.	12–30	1–5	....	improving.	no.	none.	vill'e well shaded.	....
Sterling,	loam.	granite chips.	....	1–4	plow, scraper,	neither.	no.	none.	very limited.	see com.
Stonington,	gravel, earth.	stone, gravel.	12–16	3	plow, ox shovels.	improving.	no.	none.	very limited	out of villages.
Stratford,	roadside.	....	....	3–4	....	neither.	no.	none.	few shade.	....
Suffield,	gravel.	....	12–20	3–10	....	improving.	no.	none.	limited.	....
Thompson,	roadside.	....	15–30	2–4	....	neither.	no.	none.	limited.	....
Tolland,	soil.	stone, gravel.	8–22	2–4	Brooks scraper.	neither.	no.	none.	very limited.	....
Torrington,	stone, gravel.	stone, gravel.	....	4–6	....	improving.	some.	very little.	limited.	....
Trumbull,	....	....	....	....	....	....	....	....	....	....
Union,	gravel.	blasting, gravel.	16–18	3–6	Brooks scraper.	improving.	no.	none.	very limited.	....
Vernon,	roadside.	gravel.	8–22	3	Brooks and Dudley scraper.	improving.	no.	none.	very few.	....
Voluntown,	loam, gravel.	stone, gravel.	....	2–4	....	improving.	yes.	none.	very limited.	roads by labor tax.

* Not in village.

STATISTICS OF ROADS (CONTINUED.)

Cities and towns.	Materials used.	In bad places.	Width of path in feet.	Width of highway by rods.	Tools or machines	Relative condition of roads.	Are cattle allowed on highways?	Means used to utilize land.	Shade or fruit trees.	Remarks.
Wallingford,	....	....	30	3	....	deteriorating.	no.	....	shade trees gen'ly	poor to let roads out by contr't
Warren,	earth.	stone, earth.	12	2-4	plow, scraper,	improving.	yes.	....	to some extent.	....
Washington,	dirt, gravel.	....	....	....	....	con't, not imp'd	yes.	fenced in.	limited.	....
Waterbury,	....	....	....	....	....	....	....	....	....	....
Waterford,	dirt, gravel.	stone, dirt.	10	2-½	ox scrapers.	improving.	no.	none.	very small.	....
Watertown,	....	....	....	....	....	....	....	....	....	....
Westbrook,	roadside.	cobble stone.	16	4	....	open question.	no.	....	near dwellings.	....
West Hartford,	gravel.	stone, gravel.	20	3-4	....	improving.	no.	none.	limited.	....
Weston,	roadside.	stone and gravel.	10-16	3	plow, scraper.	improving.	no-	very little.	near dwellings.	see com.
Westport,	roadside.	gravel.	12	2	plow, scraper,	improving.	no.	neglected.	limited.	....
Wethersfield,	roadside.	gravel.	30-40	4-6	diagonal scraper.	good condition.	limi'd	apple trees.	village shade.	see com.
Willington,	gravel.	gravel,	10-16	2-4	Brooks scraper.	neither.	no.	none.	scarcely.	....
Wilton,	....	....	....	....	....	....	....	....	....	....
Winchester,	gravel, loam.	sand.	14-16	2-4	plow and scraper.	improving.	no.	very little.	very little outside	of borough of Winsted.
Windham,	....	....	....	....	....	....	....	....	....	....
Windsor,	loam, gravel.	stone, gravel.	18	3-5	plow, scraper.	improving.	no.	none.	very little.	see com.
Windsor Locks,	....	....	....	....	....	....	....	....	....	....
Wolcott,	loam, gravel.	stone, gravel.	14	3	....	improving.	some.	none.	....	same plan as fifty years ago.
Woodbridge,	earth.	stone.	14-20	2-6	Blakes crusher for stone.	improving.	no.	none.	near dwellings.	see com.
Woodbury,	....	....	....	....	....	....	....	....	....	....
Woodstock,	roadside.	stone, earth.	12-15	2-4	patent scraper.	improving.	no.	fruit trees.	moderate extent.	....

REMARKS ON ROADS.

Barkhamsted. The length of roads in this town is about 85 miles. They are under contract for repairs for the term of five years from the 1st of November, 1874, for fifteen hundred dollars per annum.

For the past fifteen years they have been repaired on contract in small sections, from one to five miles; they have not improved as a whole although some contractors did improve their sections.

The expense of our bridges varies from year to year.

The past year we have built two new bridges, one an iron bridge, 124 feet in length, single span; cost $2,500. The other is built of southern pine timber, 160 feet in length, two spans 80 feet each, sides covered and painted; cost $2160.

In addition to these we have one bridge 200 feet long, four of 90 feet each, 8 about 30 feet each, and a number of small ones, making in all about 1,700 feet in length. Our long bridges have heretofore been built in sections of about 40 feet, supported by trestle work, costing from $4.50 to $5 per foot in length.

No toll-bridges or turnpike road in the town. Cattle are not allowed to run on the highway. Street fences are generally maintained.

The surface of the ground is generally hilly, and the roads very liable to wash. Our present contractor is repairing the hills without water bars; hope he will succeed, by adopting that course, for it certainly is more agreeable traveling over hills that have none of those bars.*

Berlin. We have tried pretty thoroughly letting them out

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* The total cost of bridges in Barkhamsted, for 1875, as taken from report of town accounts is as follows:

Riverton iron bridge, abutments, filling and signs,	$3670.12
Pleasant Valley,	2250.69
Other bridges,	554.80
Bridge Committee,	378.00
	6853.61

T. S. G.

by contract, and also by districts, but we think that by the plan we are now pursuing—having our cattle, these kept on the town-farm, and boarding the men there that we hire to work the roads, we get more work and better roads than any plan tried yet.

BETHEL. Formerly appointed six surveyors, and the expenses were $2,500. By the present plan two surveyors, hiring men by the week, and town owning the team, think we shall save from $800 to $1,000 a year. On account of freshet last year we had about $1,500 extra expense.

BETHLEHEM. Fences are maintained from necessity, many would mow their roadsides, but from the fact that some will turn out their horses and cattle to annoy their neighbors, and that the haywards neglect their duty. Our contractors want large pay for doing very little work.

BRISTOL. In the month of August last, we had a very heavy flood, two of the large bridges were carried off, and another so much injured, that it was decided to be best to take it away and build anew, and we have just completed the erection of three new bridges of iron at a cost of $11,134.

CANAAN. We pay money enough for repairs of roads, were it laid out judiciously, to have our roads in more of an improved condition than they are now.

CHATHAM. One great defect in our system is, we employ men to work, to get their tax, who are not practical road-workers. The repairs are not permanent. Too little pains is taken in selecting the material; sand is used when gravel should be; our roads are not sufficiently rounded, so that the water passes off freely; ditches in many places are higher than the road. We think there is some improvement in building our small bridges. We generally use stone, costing a little more, but giving greater permanency than wood. Road making in our town is in its infancy. We trust we shall receive some important information on the subject from your discussions.

CHESHIRE. The working of our roads is a difficult subject to solve satisfactorily. Our present mode of working them gives the best satisfaction of any that we have tried, which is districting them out to be worked by persons, to the acceptance of disinterested road inspectors; and no pay until accepted. It works generally very well, but not always; it depends much on the contractor; it is a difficult subject the best way you can fix it.

COLCHESTER. We have expended twenty thousand dollars on our roads in the last two years; hiring help by the day.

COLEBROOK. Nothing to say, only that half the money properly expended would make the roads better.

COLUMBIA. In many cases the modes practiced are sadly imperfect. If a road is improperly constructed, its future condition almost invariably is bad, and imperfect repairing only adds to the difficulty. Too little attention paid to grading, cutting down the summits, and filling at the bottom of hills, and also in digging deep enough to get good material.

DANBURY. There are fifteen highway districts in Danbury, three of them in the borough. These three have about 18 miles of road, which costs for repairs, about $60 per mile. We once let the roads by contract for repairs for a term of three years, which gave us the best roads we ever had at one half the usual expense. There is no better way to secure comfortable and satisfactory roads than to let them for a term of years, to trusty, responsible persons, under sufficient bonds. We have no expensive bridges. Our roads are divided into three classes: the first 18 feet wide, leading to neighboring towns, the second 12, and the third just wide enough for the wheels to pass between large rocks.

EASTFORD. We have usually appointed a Highway Surveyor for each district, and appropriated about 3 to 4 mills on a dollar of assessment, to be worked out, or expended by the respective Surveyors or Overseers. But much dissatisfaction has arisen from this method, and we have therefore contracted our roads for five years, to be repaired to the acceptance of a committee appointed from another town, for that purpose, and we hope to materially improve our roads.

EAST GRANBY. No person should be allowed to cart earth from the highway for the purpose of making manure. All roads should be under the charge of a special commissioner, and all work should be done according to his orders, and he should have power to set back fences when encroachments have been made. With proper management and care, under the charge of a good commissioner, who understands his business, we might have far superior roads, at much less expense than at present.

FARMINGTON. Roads are repaired by manager of town farm, and cattle owned by town, and kept on the farm.

HARTFORD. Only the bridges over Little or Park river and its tributaries, and over R. R. tracks, 4 stone bridges, 2 iron over river, 3 do. over R. R. tracks, 5 wooden bridges. In addition, 2 wooden and 1 iron bridge on the Bushnell Park; will average about 100 feet long. Superstructure of iron bridges cost from $5,000 to $12,500 each. Abutments various cost. Capitol avenue bridge across Park river, total cost, $31,000. 3 stone bridges were built a long time ago; probable cost about 10,000 each. Farmington avenue stone bridge built 1869–70, cost $35,000. Toll-gate only on bridge to East Hartford, 1,000 feet. Last year was a more expensive one in road-making in town than for years previously, owing to the opening of a continuous road through new territory and straightening old roads. Proprietors have been discouraged from planting trees, because so many have been cut down by change of grade. All roads are now constructed and repaired with high curve or convexity on the cross section. Roads must be rounded if the water is to run off. Flat roads will be muddy.

HARWINTON. Our roads have been worked by the contract system for over thirty-five years. Been inspected by a disinterested man. The system has given general satisfaction. It is much cheaper for us than it would be to have the work done by the day, although we might get more width to our roads than we do by the contract system. Our roads generally are too narrow for convenience in passing teams. Our grand levy foots up only five hundred thousand dollars, and according to that, it takes between 3 and 4 mills to support our roads and bridges in ordinary times.

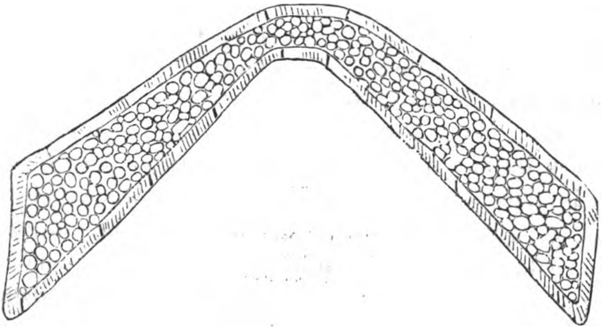
LEBANON.—Where the grass will pay for cutting the "boys" are allowed to "clip" it off, and when it does not we generally raise a crop of brush until it becomes an intolerable nuisance to the traveler, and then it furnishes a job for somebody at public expense. Occasionally a land owner plants shade and fruit trees upon his front to beautify it. We need some law to protect our little lawns from being trampled upon and cut up in muddy times by teams which should use the traveled path. I am not a road builder and perhaps hardly competent to suggest the best method for constructing and repairing highways. My motto for doing work is, "what is not worth well doing" should be left for the next generation to perform. I believe in repairing highways thoroughly,—that is, when they are used to any considerable extent. Make them broad for travel, well rounded to shed rain-falls, with good and efficient ditches and sluiceways to keep the water from the traveled track; fill, unless too expensive, swampy places with stone and cover with gravel.

LISBON.—I think there should be some means employed to compel the keeping down of brush on the road sides. I think the greatest improvement is the clearing out the rocks; there are too many covered year after year.

MANCHESTER.—In Manchester, as taken carefully with dividers from an old town map, adding later road extensions by estimate, we have not far from eighty miles of public road. Our total road bills amounted last year to $3,825.21. I have no former accounts at hand, but judge that we are paying out more money for roads now than formerly. That makes the average cost per mile $48 or $50 say, in round numbers. The bridge account, considering there have been no destructive floods, is larger than ordinary, namely, $3,225.94. This includes some new and durable stone culverts or bridges, and one new bridge across a railway cut that cost $1,500. We have no bridges longer than is required to span the Hockanum, 50 to 75 feet. There are five of wood. Of late stone arches are being built across ravines and sluice-ways where it is desirable to raise the bed of the road. I can only guess at the total cost of our bridges,—say $20,000. They are in better condition, as respects railings, etc., than ever before since my remembrance. After the wash-out a few years since, many bridges that formerly rested upon wooden abutments have been supported with stone work. We have no toll bridges. Roads are mostly worked by contract, at so much per day. One notable exception is that in the vicinity of South Manchester, where a large manufacturing firm attends to the village streets adjoining its extensive landed property, making improvements in the grade and solidity of the road-bed from year to year. Can report one instance where the selectmen contributed a part towards a road improvement planned by a private person adjoining his premises, and believe the public are very generally satisfied with the result. The town gave $60, interested proprietors something over $100 in labor, additional, for the sake of getting the work done according to local notions. A little public money goes a great ways on the road where a lively private ambition is enlisted to spend it well. The soil ranges from the lightest sand to moderately heavy sandy loam. Our gravel is mostly composed of sandstone pebbles, scarcely hard enough for permanence. The general surface would be called rolling, with some moderate heights. Breaks upon wagons are rarely seen. In repairing roads we have used turf, loam, and gutter scrapings mostly. We have tried clay some and hard pan some; both to our sorrow. Gravel is becoming popular, and some are beginning to think that stone, where convenient, would be the cheapest. In one or two instances I have seen low, miry places permanently hardened with stone. The width of path for travel is ten, fifteen, and twenty-five feet. The width between the wheel tracks is four feet for one horse, five feet three or four inches for two horses. One horse lumber wagons for the farm and factory, of outside width, are being tried experimentally, and approved. As roads are hardened, the "York track" for light driving becomes less objectionable. Tires of five and six inch width for ox and horse carts are coming in. Four inch tire for heavy freight wagons are generally used. It is seen that wide tires wear our roads less.

Our highways were originally laid out from three to eight rods wide. The latter is the common measurement, often shrunken by encroaching proprietors to two rods and even less. The road tools in use are nothing new or uncommon. There is a heavy adjustable diagonal scraper, for turnpiking. Perhaps our oaken ox shovels, shod with steel and bound with iron, are peculiarly light and worthy of examination. Harrows and rollers are rarely seen on the road. The "Warren" hoe is a proper road-mender's tool, and so is the "Partridge" stone fork. There are no toll roads in town. In spite of many mistakes, it is plain that roads are growing better, and our people are taking a more intelligent interest in the common roads. Cattle are not allowed to run in the highways, and street fences are coming into disuse from our villages outwards. Roadside grass and weeds are mowed to some extent for use or looks. Considerable pains are taken with roadside trees.

Bars for turning water off the road can and ought to be made of stone, being far cheaper in the long run than bars of earth. A triangular paved gutter of pebbles, eighteen or twenty inches wide, lying across the traveled path can be made to shed the water of ruts and tow-path with the least possible obstruction to travel. The gutter is a ⋀, with the apex in the center of the traveled path and pointing up the slope of the road. The gutter should be curbed securely across the lower side, at both ends, and part way, at least, around the upper side, at each end, using durable stone for



curbing, that is, three or four inches in thickness, and fifteen to twenty inches or more wide. When the curbing is solid and permanent, the paving stone may be smaller. Avoid making a deep gutter. Gutters and crossings clumsily constructed very justly bring this method of water bars into disrepute. The curbstones in our improved gravel road bar may descend with the road, and the dish of the gutter need not be ordinarily more than one and one-half inches deep.

It is a common thing, where gravel or earth is applied with carts and wagons to the road-bed, for the new work to be left as finished, in such a heavy condition that no loaded vehicles can be hauled over it. Road makers themselves are often obliged to avoid running their loads upon freshly dumped material because their cart-tires are too narrow to override the soft stuff. Yet the public, after a long and troublous time, manage to roll down such pieces of road. This rude and neglectful custom needs only to be understood to be condemned. The remedy consists in having carts and wagons with broad tires for road work, and commencing all new fills at the end nearest the gravel or earth pit, so, as the improvement extends, to impact or solidify it by the tread of teams and wheels. A small cash bounty from the State for a year or two, in favor of broad tired carts and wagons, would serve to point the public mind towards this evil. Many old carts that are yet serviceable would repay the expense of broader rims and tires for farm use, as well as occasional road work.

Whether convict labor can well be employed in road work, is a question. Many towns bordering the Connecticut valley would use broken stone of a durable quality, if it were to be had. Is the State labor at Wethersfield occupied to the best public advantage? If society is awakening to the need and importance of better common roads, then its condemned prisoners might be made to share in the task of improvement. In the hands of capable men, impressed with the essential nobility of the end in view, road work would not be disgraced by convict labor. And convict labor might be so administered upon our highways by the agents of a just and humane society as to result in the edification of the convict himself.

Certainly, if the classes that don't know what to do with themselves are increasing, it is a matter of public safety to provide them work; and the site for a State's prison should include within its grounds an inexhaustible supply of trap rock.

MANSFIELD. Some mow the roadsides, where it will pay, but generally they run to weeds, briars, and brush. Comparatively few shade trees are planted by the roadside at the present day; less, I think than formerly. About twenty years ago I put out a row of apple trees on each side of the highway for considerable distance past my house, and they are looked upon by most people as a great ornament to the road, besides yielding much more fruit of an excellent quality than is needed for the family. Fruit trees of various kinds should be set by the roadside wherever the soil is suitable, especially early varieties of apple and pear, so that the traveler could partake without money or price.

Our roads were repaired by contract for five years and were much improved in condition, and had the plan been continued we should have had much better roads at less cost than now, but there were serious objections raised, as some thought, and the plan was abandoned for a worse one. When tax-payers remember that they are one family, having a common interest in the repair of roads, as well as in all town affairs, then united, earnest work will tell on our roads.

In my view (and I have had thirty years experience in the business), the cheapest way to repair roads is to use the improved scrapers, and all other necessary tools to follow a good team. Employ just enough of good help to work the team, and never cart dirt or material unless to mix soils to harden the road-bed. Make the traveled path wide, oval, good ditches and out-drains, and that will be all that will be needed for a good road.

MIDDLETOWN. Two bridges of wrought iron; one of wrought and cast iron; one stone arch bridge, rest ordinary wooden trusses. The Herthell cast and wrought iron truss, 110 feet span, cost, in 1873, $4,173.62, exclusive of abutments, etc.; the other two wrought iron bridges of 40 and 50 feet span, respectively, cost $2,300. The stone arch bridge across a deep ravine, about 250 feet long, with three arches, cost about $30,000 several years since.

Formerly roads were repaired by working out taxes, afterwards by contract, now by day labor, under supervision of the selectmen.

MILFORD. It is a matter to which, for the past twenty years, I have given much thought, and now believe that if a public sentiment could be created in favor of a more thorough manner of proceeding in making and repairing roads, the next ten years to come would show results permanent and durable, as well as the saving of future expense, and greatly enhance the convenience and comfort of public travel. The western, northern and eastern sections of this town are hilly, with the most part a hard, compact, and stony soil. The central and southern, portions are gently rolling, with considerable level land. Half of this section is nearly free from stones, with a soil that varies from a light and porous loam to a heavy and dark soil. To-day all the available help of men and teams in town are employed in repairing damages to the roads, which have been rendered almost impassable—except in the southern part—by the late heavy rains.

The first Selectman, who has the best opportunities for knowing what the cost to the town is for repairing and making the roads passable, states that $3,000 will not more than cover the cost. Had the right system prevailed in making and repairing the said roads, the major part of that expense would have been saved. The present system prevailing here in repairing roads is for the town to appropriate such an amount as is deemed sufficient to keep the roads in order and make needful repairs. This amount is ample if rightfully applied. The town is divided into districts, and a surveyor from each district is appointed by the town to call out the taxpayers at stated seasons to work out their road tax. In most cases it is a mere farce; the roads are but little improved, only kept passable. Where the roadway has a steep grade, very little pains is taken to keep the water from flowing directly in the road-bed, except at intervals, to make an obstruction to the descent of the water in the shape of a mound of earth directly across the path, which makes driving down a hill unpleasant and offers really but a slight resistance to descending water, and in long continued rains is sure to be cut away, and the whole road-bed throughout its descent gullied out. Where the roads run through level land they are not raised enough to drain off the water thoroughly. Only at times is a quantity of sticky soil thrown in to fill a slough. In this loose and slipshod way have thousands upon thousands of dollars been wasted, and worse than wasted. Not even in the most central and thickly populated portion of the town, where the tax is amply sufficient to make dry, lasting, and solid roads, is it done; owing to the want of right knowledge in those that have the direction of the business. And now, has the experience of any one been such as to point to a better way? We think so.

In nearly all parts of our town the most valuable materials are at hand for making and repairing roads, which, if we avail ourselves of them, will prove of lasting benefit to us, viz.: stone and gravel; stones that are not wanted in the fields of the thorough farmer, and are often left on the side of the road to disfigure it. These, when carted out of a field, should be used in all low places of the road-bed and covered with gravel or loam. Stones put in from eight inches to one foot in depth in any slough, and properly covered, will make a permanent improvement on the road; and heavy loads at any season of the year can be driven over it with ease and safety. Eight inches of small stones with a covering of gravel laid through a field where the ground was soft and spongy, and it was impossible to pass over with a heavy load, is as solid to-day as the year it was done, which was twenty years ago. The road leading north from my house for almost twenty rods, in 1869, was as bad as any in town. In 1870, from my fields, I carted in small stones to the depth of one foot and covered them with gravel. There has been much heavy carting over it since, and to-day it is as solid and dry as when first made, while all around muddy roads abound and travel is much impeded.

Great care should be taken to turn water from the roads into adjoining fields that its volume may be decreased as much as possible in the roadway and by the roadside.

On all descending grades, from the brow to the foot, if the water is liable to run in the roadway, gentle mounds should be raised at intervals of three or four rods, made of stone, in the shape of a turtle's back, and covered with gravel or loam. With proper care these can be made so as not to impede travel in the least, and will be a sure protection to the road from being cut away by running water when the rains are heavy.

The roadway to bridges should be made wholly of stone, the height that is needed, with a covering of gravel. Out of seven bridges on one stream of water running through the centre of our town, five were made nearly impassable by the washing away of all the dirt immediately adjoining the bridges by the late freshet, the approach to them being simply of dirt; entailing large expense upon the town for repairs.

But it is not easy to arouse a sleepy community from their stupor to act promptly on any measure that will be an improvement on the past, for the reason that the cities are drawing away our progressive and energetic men, as well as our capital, leaving the country towns desolate. This, in time, will react on the great centres that are absorbing so much of our resources.

MONTVILLE.—A road properly constructed can be kept in repair for one-half the expense of one not half made. The town furnishes all the tools for repairing roads.

OXFORD.—Roads should be well rounded up, with sluices in place of water bars, mud holes graveled instead of filled with adjoining clay and deep sand covered with clay or gravel.

POMFRET.—Not much pains is taken by the land owners to utilize the land, only many encroach upon the highway by setting their fences into the road and tipping stones and other debris therein, taking all the good soil to put in their yards. A few persons set out trees for shade, so that our town compares favorably with those adjacent. We pay money enough to have our roads improved and in good order. The contract system has done better than any we have tried of late. But it is extremely difficult to find men who are capable and willing to superintend the repairs, who will do it thoroughly without *fear or favor* of any contractor. Contractors, like all other men, do as little work as they are allowed and get their pay, and they are quite successful.

Roxbury.—We favor the plan of making a narrow road best, the highest in the middle, and as few water butts as possible.

Salem.—Formerly by districts, now by selectmen. Our citizens are well pleased with the change in working the roads. We authorize a selectman to work them and appropriate a sum of money for the same,—last year $800, this year $750; and, with road scraper, the roads are much better than when worked by surveyors with $1000 per year.

Salisbury.—The selectmen, by vote of town, were directed to keep the roads in repair, and they hired an overseer, who spent his entire time, and he hired such men as he thought best for the work; the town bought two yoke of oxen and the tools; the scrapers were the long kind, five to seven feet long; two men to handle them. A number of men, about five, began work the middle of April, stopped the first of October, and in that time the same men with the aid of a stone mason built an arch stone bridge ten feet arch, sixteen feet wide, six feet high, cost $450, not included in road expenses. Ninety-two miles of road in town. Forty miles is what is called double track, balance single track (narrower). All sluices and bridges less than four feet wide are included in road expenses, and also all timber for the same. Almost all plowing and scraping was done by August and but little work done in September. The cost of working the roads for the past season amounts to $2,200, and for the same for the previous eight years, $7,500 yearly. The roads for that space of time were let by contract by seven road commissioners to different persons from three dollars upwards, mostly to farmers. Road making under that system was, in most cases, deferred till late in the season, and caused bad traveling in autumn and spring, and generally the work done under this former system was by men who were not practical road makers, and had teams not used to such work. The roads of the town will be worked next season the same as last, and will not under ordinary circumstances cost more than two or or three thousand dollars. The success of this new system depends largely upon having a good practical road maker as overseer or director of the work.

SEYMOUR.—The roadside is used as a place for refuse material, rocks, etc. One great care has been to keep the tracks free from loose stones; another to occasionally make a permanent improvement; all the time aiming to make the expense as small as possible.

SOUTHBURY.—We have had our roads or attempted to have them kept in repair for the last three years by two agents, one in each society, who were to do it by contract, but have made but very few contracts, have had them worked by the day, and have, I think, given poor satisfaction. The selectmen have formerly managed the roads, and I think after the first of January the town will put them into their hands again. They have generally contracted for three years, excepting some of the large bridges.

STERLING.—We once tried Thomas Barber's road repairer, and had the best road we ever had in town, but the cost of team was too much to make it pay in our poor town, and the roads are too stony for machinery. Where machines can be used roads can be repaired for less than one-half what it costs the old way.

WESTON.—I have to say our roads will compare favorably with those of the adjoining towns, and we try to keep and maintain them in perfect order; but still there is room for great improvement.

WETHERSFIELD.—There are in this town (as measured from the county map,) about thirty-six miles of improved roads, and about six miles of road on which no labor is expended. The average annual cost for ordinary repairs on roads and bridges for the past ten years, $1,476.74, as per reports of the selectmen. Average cost per mile for roads that are kept in repair, about $40.00. There are five arched bridges, built of

Portland freestone, one of which is forty feet long by fifteen feet span; four, twenty feet long by ten feet span, also built of Portland stone; two wooden bridges with stone abutments, besides forty stone culverts, average size, twenty inches by thirty inches and twenty feet long. One bridge cost $2,350, one $1,000, three $500 each, total $4,850. Stone culverts, freestone walls, and North river flagging for tops, cost $1.00 per foot "running measure." No toll bridges. Since 1871, the roads have been repaired under the supervision of the selectmen. The eastern part of the town is sandy loam; west of the railroad is gravelly with some stone. Two ridges run through the town from north to south. The material generally used for repairs is that which lies on each side of the road-bed. On the main road between Wethersfield and Hartford stone and gravel is used to some extent. The road-beds are generally from thirty to forty-five feet wide. Team-wagons and ox-carts track five feet six inches from center to center. Business wagons four feet eight inches to six feet two inches. Light driving wagons four feet six inches to four feet ten inches. The highways are from sixty to one hundred feet wide.

Diagonal scrapers and common cast iron ox scrapers are generally used. There are no turnpikes. The roads are in very good condition during the summer. In the winter and spring they are very muddy or very rough. Cattle run in the road to a very limited extent. Street fences are maintained. On some streets apple trees are planted in the village. Elm and maple trees are planted by the roadside.

My opinion is that a law obliging owners of real estate to keep the roads in repair would be found to give us better roads at a much less cost; that is, the owners of land through which a highway passes should be obliged to keep said portion of highway in repair. I think a law framed on this basis would be found to meet the wants of the community better than any other plan that can be devised.

WINDSOR. Within the last year I have made new road-bed on our main roads nearly their entire length, by putting in one foot deep of flat hard stone in miry places and then ten inches of gravel on top; in sandy places, by putting on about fifteen to eighteen inches of gravel. We now have on our main thoroughfares the finest roads in the country.

WOODBRIDGE. The best plan for repairing is by contract for five years, and the contractor shown that it is for his interest to thoroughly repair the first year, and after that to keep the dirt on the road-bed instead of letting it wash off by rains, and then hauling on again; that it will not cost over one-tenth as much to keep the road good as to repair it when bad.

REMARKS ON ROAD STATISTICS FROM QUESTIONS, ON PAGES 204-5.

In condensing and tabulating the returns made to the inquiries on roads, I have preserved, as far as possible, the language of the replies. The cost reported is sometimes the average for a term of years, in others the actual cost for 1875.

The answers have been omitted from the tables whenever it appeared that the question was misunderstood.

Question 1st, on length of roads, gives 8,778 for 114 towns and cities, making an average of 77 miles for each, and an aggregate of 12,859 miles in the 167 towns of the State. Excluding the cities, the average length of roads in each town is 74.33 miles, making for 157 towns 11,670 miles. As many of the distances are estimated, some errors may exist in particular cases, yet the general average will be true. The returns of some towns will be added to the tables, but my conclusions have been drawn from the 114 towns now tabulated.

Question 2d, omitting the cities; the annual cost of repair in 110 towns foots up $266,485, which makes for 157 towns a sum of $378,346. The ten cities expend from $250,000 to $300,000 annually. Add the cost of bridges not included in roads, of turnpikes, and of new roads not included, and we have the grand total as the annual cost for roads and bridges in the state of about one million of dollars.

Question 3d. The average cost per mile for the State, omitting the cities, as before, is $32.59. Compared with the population and taxable property, the cost of roads is much greater in the agricultural than the manufacturing towns.

Questions 4th, 5th, 6th, 7th, 8th, 9th, on bridges, have too imperfect returns to allow of any generalization.

Question 10th is more fully answered in the remarks of correspondents than could appear in the tables. No one system appears to give general satisfaction.

Questions 11th, 12th, 13th, 14th. The answers to these explain some replies that otherwise appear unreasonable.

Question 15th, on width of path for travel, has replies of wide range. Great difference of opinion prevails on this topic.

Question 16th. Omitted in the table, as the question was often misapprehended or answered vaguely.

Question 17th, on width of highway. Answers vary from from 1 to 12 rods. A fair average for the State is three rods. Taking the number of miles in city and country at 12,859, we have 77,154 acres occupied by the highways in the State, and counting fence, only on one side of the same, as built on account of highway, we have 4,114,880 rods for fencing the highway.

Question 18th, on tools and machines, finds a few towns using to advantage Brooks' scraper and Dudley's diagonal scraper; most, however, are satisfied with the old common plow and scraper.

Question 19th, on turnpikes, has elicited very imperfect returns, and they have been omitted in the table. The Connecticut Register reports eight turnpikes as still in charge of commissioners.

Question 20th. The replies on relative condition of roads, indicate that, with few exceptions, they are improving.

Questions 21st, 22d, 23d. Few towns allow cattle to remain on the highways, and there is a general desire manifested by the reports to keep them under restraint. Yet there is but one town in the State, Manchester, where it has been carried out so fully that street fences can be dispensed with. Few as yet seem to appreciate the advantages they would enjoy if cattle were always restrained. Some few mow the roadsides, but more often they are used as depositories of stones, brush, and all kinds of rubbish, and thus become nurseries of weeds and bushes to spread their seeds upon adjoining fields; in this way not only is the land in the highway wasted for any productive use, but it damages the neighboring inclosures.

Question 24th. The returns show that the farmers are slow to avail themselves of the privilege of planting their own roadsides with trees. Villagers are ahead here, as they often are also with their gardens. The men who have the best opportunities to plant trees and to make good gardens, who would be most benefited by such, are left far in the rear by their village neighbors. The returns of tree planting are not so slow as we are apt to imagine. Plant one dozen good trees this centennial year and take care of them, and ten years hence you would not sell one of them for the cost of the whole, 1200 per cent. in ten years.

Question 25th. It is difficult to give a summary of the opinions expressed by our correspondents. The various surface, quality of soil, clay, loam, sand, and rock, amount of travel, and hence the expenditure allowed for road making must prevent any general rules, except of the most liberal character. To have a good, permanent road, the road-bed must be firm and so graded as to facilitate travel and protected so as to be safe from the action of water. While common earth must be our main reliance, we can save much by choosing between muck and gravel, a good, firm sub-soil, and vegetable mold made up of turf and weeds.

The advantage of using wide tire where heavy loads are to be carried on ordinary roads or over fields, has been often noticed but has hitherto been too much neglected. A fact related to me by Elias Scoville, of Cornwall, is in point. Mr. Scoville was employed with his wheel derricks, or rock-pullers, of the Bolles pattern, to transport the heaviest block of stone for the arch of the Hoosac tunnel. Two derricks were united, making a four-wheeled truck, the tires being respectively five and six inches wide. Upon this was transported a stone weighing thirteen tons, over graded earth, without materially sinking in, while stones of six tons on ordinary trucks, with 2½-inch tire, cut in badly.

Some of my correspondents say hard things about the way the roads are repaired and the money expended, which would do little credit to their town officials if published, but I have allowed some to enter their protests against this waste of the public funds which goes on from year to year, the combined result of ignorance and indifference on the part of town officers, road-makers, and tax-payers. We believe this subject is worthy of study, and that this will result in better roads at less cost than we now have, bringing more comfort and more prosperity to the whole community.

REPORT OF THE VISITING COMMITTEE ON FARMS.

Messrs. Albert Day and J. M. Hubbard were appointed a committee to visit farms in Hartford County, and though visiting together have divided the duty of reporting their observations. The committee for Tolland County were unable to attend to their duties, and made no report.

SOUTH MANCHESTER.

> "Sweet Auburn! loveliest village of the plain,
> Where health and plenty cheer'd the laboring swain,
> Where smiling spring its earliest visit paid,
> And parting summer's lingering bloom delay'd."

South Manchester, the home of the Cheney brothers, is reached from the Hartford, Providence & Fishkill Railroad by a branch road of four miles.

We could hardly imagine that we had reached our destination when the train stopped at the depot, clean and well appointed, with shade trees here and there, and a nice fine chapel built of brick on the opposite side where religious services are held on Sundays and lectures, etc., delivered on week days, as occasion offers. Not far from this are the mills so noted for the production of American silks, which for beauty, finish, design, etc., are equal to any made in the United States.

Without special knowledge of manufacturing or machinery, or the complex and delicate operations necessary for the production of those goods, we may well excuse ourselves from entering upon the task of describing the processes required in their production. An idea of the vast work done here will be formed when it is told that eleven hundred persons are employed in the works, whose pay amounts to $40,000 per month, and that the value of the stock in the works at the lowest season of the year, amounts to $1,000,000.

Well made roads running in different directions take one all over a village of some one hundred and fifty houses, scattered here and there, all neatly painted, and presenting an unmistakable air of comfort and happiness. The neat and spacious lawns around the houses, adorned with rustic seats, had just been cropped of their luxuriant grasses. Ever and anon flower-beds of varied hues, giving fragrance to the atmosphere, met the eye with a loveliness rarely witnessed.

Not a wall or fence of any kind to hedge in the highways or mar the symmetry or order of the arrangement was seen. The soil is sandy and not naturally fertile, but from continuous care in top dressing, was in the highest condition. The farm and entire village, which belongs to these gentlemen, contains seven hundred and fifty acres, and to each brother is assigned a separate care.

The barn for farm purposes on the border of the village is a substantial structure, one hundred and one feet long and forty feet wide, with stalls the entire length of one side, for cattle, horses, etc., and was filled with choice hay. A large herd of well-fed cows furnish milk for the village.

By an ingenious plan the cattle are supplied with fresh water, brought directly in front of them into small troughs through pipes from a fountain two miles distant. This also supplies the houses and other buildings where it is wanted, with conveniences for extinguishing fire, etc.

Great quantities of garden vegetables are raised for the use of the villagers. Sweet corn of mammoth growth and large quantities of the new and valuable kinds of potatoes were nearly fit to harvest. There was scarcely a weed to be seen in the cultivated fields, by the roadside or in the meadows.

The piggery is new, clean, and well adapted to its use, and for the comfort of some fat, sleek Berkshires that lay basking in the sun. Their good nature and readiness to thrive make them favorites.

No cows, swine, or poultry are allowed in the village, hence those rambling, unsightly buildings which cluster around the rear of ordinary fine houses, a shelter for weeds and a refuge for broken down material, do not exist, not only to the gratification of the eye, but with a proper system of drainage, insuring that purity of atmosphere so essential to health and comfort.

On another part of the premises was a mill for crushing and grinding bones, and for grinding corn for the farm and the use of the village. The bone meal, whether crude or made into superphosphate, will be of great value in enriching the lawns and farm. Everything valuable is utilized, and order reigns in all departments.

The application to the details of agriculture, of exact business habits, which are required to make manufacturers successful, is rare. Here we see the results of such a practice, and commend it most heartily to the study of our young farmers.

A visit to this place would not fail to be profitable to any one, and the enjoyment of the quiet, unaffected, and generous hospitality of these gentlemen only begets the desire to visit them again.

ENFIELD—LONG VIEW. There is no better land in New England than that lying in the valley of the Connecticut river, and no wonder that the hardy pioneers who journeyed from the Massachusetts Colony to Connecticut in search of homes, should have been content to settle in the valley of this beautiful river.

The farm of Dr. H. A. Grant, containing 155 acres of land, is in the town of Enfield. This town was formerly a district of Springfield and Longmeadow, and signifies the end of the "field," or fields on the Connecticut river in Massachusetts. At the straightening of the State line this town became a part of Connecticut.

Longview is the name of this beautiful, manorial estate, and the family mansion stands upon an elevation from which most of the farm can be seen, in the midst of a luxuriant park, and is reached by winding avenues, sheltered and beautified by trees, and the entire frontage is a neat bower embellished with rustic seats.

It was the purpose of the present proprietor when he came into possession of the estate, to make it pay, as well as to beautify it, and this has necessitated a large amount of labor and great expense.

The farm has an eastern and southern slope; the surface soil is a heavy loam and some sand; the sub-soil clay, free from stones, and more than one-fourth of it, originally, so thoroughly charged with water the greater part of the year as to make it of little value. Portions of it so wet that cattle, in July, would mire to the knee joint.

BENEFIT OF DRAINING, MANURING, AND CULTIVATION.

One of the first operations in the improvement was a thorough and systematic course of drainage, which was continued until one hundred acres were drained, and about two miles of tile drains laid, having an outlet in some cases in artificial ponds, made for that purpose, twenty-five or thirty feet in diameter in different parts of the farm, which serve as watering places during the season when cattle are in the meadows luxuriating upon the abundant aftermath which readily springs up after the hay is taken off. Other and larger portions of the water are carried off by a canal or open ditch, which extends near the length of the farm.

In digging this ditch an ingenious dam of logs was found submerged in the slimy peat, supposed to have been the work of beavers. Dr. Grant estimates that the value of this land has been increased 100 per cent. by draining, manuring, and cultivation, and we thought that the Doctor had given too low an estimate of the benefits, judging from the appearance of the land, the quantity and quality of the hay stored in his capacious barns and the rowen that was being secured at the time of our visit. Some seasons he has cut one hundred and twenty-five tons of hay, and the present season estimates it at ninety tons, besides thirty-five or forty loads of corn fodder and ten tons of oat straw, notwithstanding the severe drought which affected the crops in this state the past summer.

The land is fertilized with manure from the barn cellar, and some years ago the Doctor had the good fortune to secure for a number of years in succession some three hundred loads of wool-waste from a manufactory near by, at a cost of seventy-five to one hundred and twenty-five dollars a year, which now sells for seven to nine dollars per cord.

TOBACCO.

The far-famed Connecticut seed-leaf tobacco is grown in the greatest perfection in the valley of the Connecticut river, soft, silky, fine color, and free from coarse veins, most desirable to manufacturers of cigars, and from which so large incomes have been realized for a number of years past. Tobacco growing, however, is but a secondary object of production in the cultivation on this farm. Six acres had been secured and was hanging in the sheds, and judging by the length and width of the leaf, then in a green state, was an excellent crop, and would, when stripped from the stock, weigh 1,800 to 2,000 pounds per acre—since stripped, yield, six tons less forty pounds. Seventy loads of manure are applied to the acre at plowing, and when the land is ridged for setting out, 250 pounds of Peruvian guano and 250 pounds of plaster added. This induces a heavy growth of tobacco, and the land is raised to a high state of fertility. After the tobacco is taken off, the land is plowed and seeded to grass, and a large crop of hay is harvested the next season.

BUTTER

Making is the specialty in the working of the farm, and few gentlemen in Connecticut are better fitted for this nice and difficult work by education and determination to do their work well than Dr. Grant. He considers that among the requisites for this work are good cows, good care, good feed, and the most scrupulous observance of neatness in every operation, from the feeding and milking of the cows to the making and storing or marketing the butter.

Of the thirty-four cows kept all were Jerseys, or grade Jerseys. Ten of them were heifers and seven of the whole number dry, averaging twenty-five to twenty-seven cows giving milk through the year. The heifers drop their first calf at a little more than two years of age.

COOKING FOOD—ITS ADVANTAGES.

The cows are stabled early in the autumn, and fed with steamed food from the 15th day of October till the 10th of May, and a groom is in care of them, feeding, carding, etc.

For steaming purposes a chest of about six feet square is used, with rubber packings around the lid. This box is filled three times a week with equal quantities of cut hay, oat straw cut in the milk and corn fodder. To this is added three hundred pounds of cornmeal and two hundred and fifty pounds of wheat bran, a little salt, and two barrels of water. The steam, from a boiler of ten-horse power, four hundred and twenty-five feet distant, is let through underground pipes laid in cement, for six to eight hours, till the whole mass is cooked.

The milch cows are fed twice a day on this, giving each about two bushels of the mixture at a time and long hay where more is needed. This makes a saving of 20 per cent. in food, and an increase of 20 per cent. in the quantity and quality of the milk and butter. In proof of this the steam apparatus got out of order at one time, and the butter and milk diminished 20 per cent. both in quantity and quality of milk and butter.

Cows dropping their calves in winter, when fed on steamed food, will give as much milk as those dropping their calves in June, fed with grass, and the butter made in winter equals that made in June.

Each cow is numbered and the quantity of milk noted at each milking, and test glasses graduated at one-eighth of an inch are used to ascertain the amount of cream that will rise. The cream that rises in the first twenty-four hours will not give the correct amount of butter that can be made from a given amount of cream, but let the cream remain another twenty-four hours and that will give a close approximation to the amount of butter from a given amount of cream, as it will be thoroughly condensed, and the condensation will be from 5 to 15 per cent.

At the foot of a hill thirty rods distant from the barn is a never failing spring, clear, cold, of very even temperature, running from 45 to 46 and 48 degrees; a great peculiarity in the supply of which is, that the water probably comes from Feeding hills, distant some eight miles, and flows under the Connecticut river. The spring is surrounded by a cemented stone wall ten feet in diameter, eight feet high, and covered with an octagonal curb of wood, and all enclosed by a tasteful spring-house with every facility of ventilation. The depth is regulated by a pipe leading from the spring. Six coils of steam pipe connected with the engine control the temperature of the milk room, also of spring-house and water of spring in cold weather.

The milk is double strained into tin pails eight inches in diameter and twenty inches deep, with an air-chamber at the bottom and a narrow rim to prevent their capsizing in the water, these lowered by cords into the spring and remain there until the animal heat is expelled, when they are raised just above the water. The milk is never soured during thunder showers or variations of heat.

More cream will rise in shallow pans when the milk is not placed in springs; but there will be a loss in quality though a gain in quantity of butter.

The night's milk remains undisturbed twenty-four hours, and the morning's milk thirty-six hours, when the cream, which rises to a thickness of three, four, or five inches, according to the quality of the milk, is taken off with a skimmer, first dipped in water to keep the cream from sticking to it. The skimmer is shaped like a tunnel with the handle on the side. When a sufficient quantity of cream is collected it is put in a white oak upright churn, with a solid dasher, and the churning done by the engine, giving a perpendicular stroke and working similar to that of the walking beam that propels the wheels of a steamboat.

Four of these churns are arranged in the room near the engine, so that when the dasher goes down in one churn it is raised in the opposite one and the movement is under the control of the engineer. Dr. Grant prefers a temperature of 60 degrees for the cream, and about forty-eight strokes a minute by the dasher brings the butter in an hour. As soon as the butter granulations appear, a few quarts of spring water are poured into the churn for the dasher to play upon and to facilitate the separation of the butter from the butter-milk. The butter is taken from the churn with a wooden ladle and the butter-milk and water worked out on an oak working table with an oak octagon lever.

Salt is then worked in, and in quantities to suit the fancy of customers; some preferring about one-fourth of an ounce of salt to a pound of butter. It is then put in a close firkin, taken to the spring room to cool, and worked into balls the next day. At the last working a large sponge wrapped in a linen napkin is used to absorb the moisture.

About five thousand pounds of butter are made annually, and the esteem in which it is held can be judged by the price it brings in market, and in our opinion, that from other butter makers pronounced *gilt-edged*, would suffer when brought into comparison with this. Small packages of twelve pounds will bring $1 per pound; but it is preferred to dispose of it by the year to the trade for less price, one person taking the entire dairy.

All butter makers know the difficulty in making nice, fragrant butter neatly, high-toned and of first quality. This is accomplished only by having everything in perfect order in every department, the food given to the cows, the right temperature of the dairy room, no unpleasant odors to be absorbed, and perfect neatness in every operation. It has never been our pleasure to have seen all these requisites more fully at command and practiced than in this dairy.

Dr. Grant has passed the prime of life, and poor health has induced him to give up the entire management of his estate to his son, a young gentleman of fine culture, who has entered upon his work with ardor and a full understanding of the duties which devolve upon him.

ALBERT DAY, Committee.

REPORT OF MR. HUBBARD.

By arrangement with Mr. Day, the duty of reporting our observations in Wethersfield, West Hartford, Farmington, Bloomfield, East Granby, and a portion of the town of Manchester, devolves on me.

The extent of the territory visited within the brief time at our command, rendered a minute examination of the whole impossible, and in case any inaccuracies should be noticed in the report, must also stand as their excuse. In Wethersfield the farms of S. M. and D. Wells were more thoroughly examined than any others. These farms lie adjacent to each other, and though owned separately, are reported as one farm. They are situated in the western section of the town, and the homestead portions occupy the eastern slope of a low ridge, running north and south, and underlaid with trap rock and sandstone; a ridge which might fairly be described as one of the foot hills of the mountain range that here and for many miles north and south bounds the valley of the Connecticut on the west. This geological formation seems everywhere to give a fertile and kindly soil, one that responds quickly to generous treatment, and that contains in its substrata no element poisonous to vegetation, thus supplying the first condition requisite to success in high farming.

ONION SEED.

Upon a portion of this farm the father of the present proprietors, many years back, commenced the culture of onion seed as a specialty, and from that time to this the crop has been a leading one upon the place. It is a crop which requires for its successful culture, specially favoring conditions of soil, climate, and weather. It needs to be handled with the skill which comes only from long experience, and when everything possible has been done for it, a few days of unfavorable weather, at the critical period of forming the seed, will cut the yield down so as to sweep away the profits upon two years of labor and expenditure. At the time of our visit, early in August, there were upon these farms ten acres of seed onions just passing their fullest bloom, and in their luxuriant growth and thorough culture, giving evidence that generous feeding and skilled management had done its best for them, and if nature was kindly in her disposition a bountiful crop would be harvested.

These fields were a beautiful sight to look upon. The long rows, straight as a line could be drawn, stretched out in far prospective over the varying undulations of the surface, each row at top a gently rounded ridge of milk-white bloom. Many growing crops are pleasant to the eye for bloom or verdure, and among these the crop of onion seed must hold a place unique and permanent. Again and again the eye sought these fields and rested upon them with great satisfaction. That the sense of smell was equally gratified, I would not undertake to affirm. Indeed I apprehend that there are those who would maintain strongly the negative of such a proposition.

Besides the crop of onion seed there were upon this farm, of other cultivated crops, seven acres of onions, five acres of tobacco, and seven acres of corn. The crop of tobacco is here incidental, and is included in the scheme of operations because of its excellence as a preparatory crop for onion seed, and to give work to the large force employed when other crops do not call for attention.

The onions are grown to afford stock for next year's crop of seed, and as only selected bulbs are used for that purpose, a large surplus remains for market. The corn, of which the crop this year is much less than usual, is grown for feed, for which the stalks are utilized to the utmost and considered of great value.

The horned stock upon the place is mainly composed of a herd of fine bred Ayrshires, the breeding of which is made a specialty with the Messrs. Wells with distinguished success. At the time of our visit the herd numbered about seventy animals, of which thirty were cows in milk. To feed such a herd as this to the best advantage is a problem which the Messrs. Wells have studied theoretically and experimentally. Their barns are fitted up with steaming apparatus, which is found very serviceable in converting crude and unpalatable fodder material into a condition in which it is relished and appropriated by the animals. But in regard to hay of good quality, cut early, and cured without injury, their judgment is that it is not materially benefited by steaming. And good hay cut early and cured without injury is what they glory in producing. In one sense it is the production to which all these farm operations point. After cropping as long as is thought desirable, their fields are seeded directly to grass, and for a term of years produce luxuriant crops. Their practice is to seed thickly, thus producing a fine as well as heavy growth, which is cut early and is usually followed by a valuable second crop. They aim at extending year by year the area of land in this condition.

The buildings upon these farms, some old and some new, are fitted up with every convenience for the special uses for which they are designed. A steam engine furnishes power for a grist-mill, for cutting hay and for any other use to which it can be advantageously applied. The boiler also furnishes steam for the purpose of cooking food. Special and ample provision is made for curing and handling their large crop of onion seed, the details of which would hardly prove of sufficient general interest to justify their introduction here. An ample and well appointed work-shop enables these gentlemen to have the large amount of repairing and other mechanical work involved in carrying on such a farm, done upon the place under their own supervision and in an advantageous manner. The quarters provided for all the domestic animals were comfortable and wholesome and arranged with particular reference to the preservation of all the manure. The stables for the horses were especially roomy, and were provided with a cement floor, laid with a slight pitch to the rear, and overlaid with heavy scantling sawed enough thinner at the end laid in front to make the standing surface level, and laid about half an inch apart, thus allowing all liquids to pass down to the cement and drain out at the rear of the stalls. In many other matters of detail, of which space will not permit a description here, similar evidences of study and care are observed.

After much experience with both oxen and horses for work animals, the Messrs. Wells have settled upon the latter as preferable for their purposes. Nearly all the team work of the farm is done by two pairs of horses: one pair of unusual weight and power, ready for, and equal to, almost any task to which their strength can be applied; the others of lighter weight and employed at lighter work. Three other horses are kept for driving and working single.

In the conduct of a business such as is here hastily and imperfectly sketched, when the object is to produce, in both vegetable and animal life, forms which are the product of the highest culture, (which would be described by many persons as unnatural, and which certainly are far removed from the productions of unaided nature,) the question of feeding becomes one of prime importance. Neither a high bred animal nor a high bred vegetable can be produced without high feeding. But high feeding without care and close observation, is wasteful and dangerous. The Messrs. Wells are believers in high feeding, both for their crops and their animals; but they find it necessary to proceed carefully and experimentally at first with any new element or combination of food for either plant or animal. When at length the value and limitations of value of any article are satisfactorily fixed, it is discarded or made use of accordingly. In practice, their bill of fare for both animals and vegetables is rich and varied, but it is the result of careful and accurate experiment. On an outlying field of their's, now made use of only as a pasture, there is an immense deposit of muck, which is a favorite article with them for composting both with stable manure and with special and concentrated fertilizers. Its value for such purposes they regard as established. Believers in the application to agriculture of the apostolic injunction to "prove all things," and "hold fast that which is good," they are ready to make trial of new foods or fertilizers, and are satisfied if out of many new articles that promised well, here and there one proves valuable. Those few are "held to," the others are discarded.

THE CULTURE OF GARDEN SEEDS

Has long been a leading industry in Wethersfield, and the business both of production and distribution is carried on in a large way by several firms and individuals in the place.

We paid a visit to the extensive establishment of Comstock, Ferre & Co., and under the escort of the gentlemanly superintendent, Mr. Ellis Adams, spent an hour or so in a hurried examination of their grounds and methods of culture. The purpose of this firm is a very comprehensive one, viz., to furnish the market with every variety of flower and vegetable seeds it demands, and to produce upon their own grounds and under their own immediate supervision all that their soil and climate will enable them to raise advantageously. Some few varieties of which the purity and vitality are easily determined, and of which they handle large quantities, are raised for them by contract in other localities. One of the chief difficulties in this business, where so many varieties of the same plant are grown, is to guard effectually the purity of the seed of each variety. The method usually adopted is to sandwich the different varieties of the same vegetable with something entirely distinct, and of sufficient extent to prevent fertilization across it. Yet it is not easy to determine where the line of safety should be drawn. Where plants are fertilized through the agency of insects, it is possible that the pollen may be brought from a point far distant. So it will be seen that the separation attained by inserting a narrow strip of some other crop does not afford a sure protection against cross fertilization. In managing this difficult feature of their business, this firm have a great advantage in the fact that the lands they cultivate, in all about one hundred and fifty acres, are in five separate parcels, in extreme distance several miles apart. By taking advantage of this situation, they are enabled to guard the purity of their seeds very effectually. If there be any branch of agriculture which can be carried on profitably on poor and foul land, it is not the culture of garden seeds. Heavily fertilized and thoroughly cultivated must be the seedsman's farm, and in this specialty, more even than in general farming, the price of success is "eternal vigilance." But success, when attained, is a more weighty and substantial success than the common farmer receives. Evidences of this fact are to be seen on every hand in Wethersfield. For, outside of the large firms who do a general business in the culture of seeds, and also include the distribution of them to the consumers, many of the farmers in the town make the culture of one or more varieties of seeds a prominent feature of their farm management. And somehow it seems as if the example constantly before their eyes of liberal fertilization and thorough culture, followed so successfully in the seed business, was effectual in inducing similar treatment of the more ordinary crops and with a corresponding success.

A ride through the different sections of the town with which we were favored through the kindness of Mr. S. M. Wells, furnished abundant evidence of the general prosperity of the community. The crops were uniformly good and the houses, outbuildings, and fences ample and well kept. Especially noticeable were the barns, many of which were comparatively new and of very ample proportions; sixty by forty feet seemed to be a favorite size, and with their good architectural proportions and neatly finished exteriors, they formed a pleasing as well as a conspicuous feature of the landscape.

The domestic animals that we saw appeared to be finely bred and well kept; and the general impression with which we left Wethersfield, after a day spent in diligent observation, was that we had witnessed an example of general success and prosperity quite unusual for a purely agricultural community. The foundations of this success were undoubtedly laid in the favoring conditions of soil and climate which are found here; but it has been built up only by a clear appreciation and an energetic improvement of these conditions.

The lesson it teaches is that of specialty in farming, and it may be confidently asserted that while in agriculture no success is possible without industry, energy, and perseverance, given these qualities and any large measure of success depends upon the selection of a specialty suited to our external conditions and also to our tastes and capacity. This choice should be made with the utmost care, and once made not lightly abandoned.

THE TOWN OF FARMINGTON

is a place of much less importance at present, both relatively and absolutely, than in former years. It was once the seat of an important trade which gave active employment to many people and was a source of wealth to all engaged in it. But the introduction of railroads has revolutionized trade, establishing new marts and channels, and leaving many of the old ones to disuse and decay. Those that have escaped this fate have saved themselves by turning their attention to manufactures, thus retaining the capital and population necessary to their prosperity.

But in Farmington this has not been done. Indeed the place seems peculiarly unfortunate in its relation to the railroad system of the State, not being sufficiently well accommodated to satisfy the needs of any manufacturing enterprise. As at present circumstanced, an agricultural prosperity seems all that is practicable for Farmington. For this her advantages are, in some respects, very great. Within the great bend of the Farmington river are enclosed thousands of acres of fertile and easily cultivated soil, and though its use is somewhat restricted by the annual overflow to which it is subject, it may well form the solid and enduring basis of an extensive and prosperous agricultural enterprise. On the rising ground to the eastward, where the village is situated, the land, though quite uneven in surface and variable in quality, will compare favorably with all but the very best agricultural districts in Connecticut. The view from the mountain range on the east is one of exceeding beauty, and its suggestions of agricultural wealth are very forcible. It does not appear, however, that a very marked prosperity characterizes the agriculture of Farmington. It lacks specialization and concentration, and therefore, almost of necessity, lacks, or seems to lack, energy of management and fails of important results. Having lost the local demand which it formerly found profit in supplying, it seems not yet to have secured anything to take its place. As an experimental attempt to plant and develop a profitable specialty in this locality,

THE FARMINGTON CREAMERY

is an object of interest, and to it our attention was chiefly directed. It is owned by an association, of which Mr. Edward Norton is secretary and active managing agent. It aims to develop the dairy interest beyond what is possible to individual effort. The design of the management is to utilize, as far as practicable, all the valuable elements of the milk. Cream, butter, and cheese are sold, and are considered profitable in the order of their mention.

The demand for cream is not, however, large enough or regular enough to make it more than an incidental feature of the business. Butter is the chief production, and the design is to produce an article of uniformly high quality, and thus earn and maintain a reputation for their products, which will always enable them to command a good price in the market.

It is not desirable in this report to go into a particular description of the arrangements and operations of the factory, as in its main features it is very similar to many others of which minute descriptions have been heretofore published, but it is proposed to notice some points which the managers of this enterprise consider settled, so far as their judgment and practice are concerned. One point is, that for a dairy where cream and butter are the chief productions, the Jersey race of cows is preferable to any other. Their record of repeated tests supplies a large amount of cumulative evidence, all pointing to this conclusion, and by the managers of this factory that point is considered to be settled.

Another point is in relation to the use of turnips as food for milch cows. Without assuming to say that they may not be harmless and even beneficial when fed with sufficient discretion, their experience is that the necessary discretion is not among the ordinary qualifications of those charged with the duty of feeding cows, and that the injury resulting from careless feeding is too great to justify the risk involved. They discourage, as far as possible, the practice of feeding turnips, and have in contemplation an imperative rule forbidding it among their patrons. Another much controverted point in dairy practice has been settled by them in favor of setting the milk in deep cans, immersed in cold water. If it be a fact that less cream and butter are secured by this process than by shallow setting, it constitutes no objection to it at this establishment, as it is not their purpose to separate all of the cream from the milk. It is designed that enough should remain with the skimmed milk to make a palatable and nutritious cheese, acceptable in the market at remunerative rates. More difficulty had been encountered here than at any other point. The cream raised by their process is, of course, unexceptionable, and they are able to make butter of uniformly good quality without serious difficulty. But the cheese vats seem at times to be the homes of malicious or mischievous spirits, who thwart the efforts of the cheese makers and turn all the processes in wrong directions, and bring out evil results. Enough of success has been attained to show success possible, and enough of failure experienced to show that all the conditions of success are not yet within their knowledge or control. The enterprise, as a whole, is successful, and is each year gaining valuable experience and strengthening itself with the producers whom it serves and the consumers whom it supplies. It seems to promise a solution of one of the problems which the farmers of that locality must solve in extending their farming operations with profit, and that is, how to make an increased stock of domestic animals remunerative. It appears to me that the agriculture of Farmington ought not to look to dairying as its only or chief source of profit. Its fertile and kindly soil and favoring climate seem to invite to the culture of some specialty from which less favored localities are excluded. As a dairy region simply, it must come in competition with all the widely extended grass region of the country. In this competition it has no material advantages, and can only expect, in this line, for a limited and moderate prosperity. But as an aid to the culture of some specialty involving skill in its management, and requiring for its production favoring conditions of soil and climate such as Farmington can supply, the dairy may be made of great service. Agricultural enterprises such as are here suggested involve the liberal, often lavish use of fertilizers. These must be produced, in a large measure, upon the farm, and just this is what the dairying interest will enable the farmers to do. The production of milk will justify high feeding. High feeding will produce rich manure, and enough of this will enable the farmer to raise any crop for which he can furnish the requisite conditions in soil, climate, and skillful management. In all these conditions Farmington ought not to stand second to any, or at all events to but very few places.

On our return from Farmington to Hartford we made a brief stop at the farm of Samuel C. Colt, situated in the southwestern portion of the town of West Hartford. The farm contains about two hundred and seventy-five acres. Its surface is considerably broken and undulating. In consequence of unfavorable weather our observations upon this farm were confined to the immediate vicinity of the buildings. So far as our examination extended the soil seemed rather heavy in texture, but of fair native fertility and well suited to grass. The leading interest on this farm is stock breeding. A herd of seventy head of pure bred Jerseys are kept, many of which are of Mr. Colt's own importation, or their descendants. At that time we did not see the herd, it being at pasture on a distant part of the farm; but those who have attended State and New England fairs for the past few years are familiar with their appearance, and the record of awards at those fairs shows the high estimation in which they are held by good judges. No difficulty is experienced in finding a market for the increase of this herd at prices eminently satisfactory.

Mr. Colt keeps also a small flock of Southdown sheep of pure blood and superior quality, and a good stock of pigs and poultry, but the Jersey herd evidently received the greater share of the owner's interest and care. The milk product of this herd is made into butter, which finds a ready market in Hartford at fifty cents per pound.

The barn upon this farm is worthy of especial notice, on account of its size, the excellence of its design and the thorough manner in which it is fitted up with every appurtenance to facilitate the labor of handling fodder materials and caring for stock. The main building is fifty by one hundred feet in size, and following what is probably the best arrangement for a large stock farm, is three stories in height. The lower story serves as a receptacle for manure and a place of storage for roots; the second is the winter home for the animals, while the third is the storage room for hay and grain. A floorway traverses this story from end to end, and just within the entrance doors platform hay-scales are placed, upon which every load of hay is weighed as it enters the barn. There is no guess work about the amount of the hay crop here. The storage capacity of this room is immense. It is arranged so that the space directly over the floor can be utilized by means of scaffolding in case of need, and when Mr. Colt's land is all brought up to his ideal standard of productiveness, he will probably need it. At present he finds room enough on the ample side mows for all the hay and grain products of the farm. All this is consumed upon the farm, and in addition considerable quantities of grain feed are purchased.

On the side of the barn opposite the stock-yard is a wing which shelters a twenty-five horse power steam engine, together with a grist mill, a saw-mill, and a cider mill, to either of which, as occasion requires, it lends its tireless power, and in addition, during the winter season, furnishes steam for the purpose of cooking fodder. These mills are, in some sense, public institutions, serving the needs of the neighborhood as well as of Mr. Colt's farm.

In addition to these a thoroughly furnished work-shop renders the industries of this farm almost independent of outside mechanical assistance, and enables the proprietor to give constant employment to a skillful and intelligent class of workmen. He employs five men constantly, and rarely has occasion to employ additional help. His workmen live upon the farm, and there is more of permanency in the relation of employer and employed in this case than is usual. These are pleasant features, but they tend to render the business more complex, and necessitate in order to success a vigilant and efficient superintendence. Mr. Colt attends to this in person and evidently finds pleasure in it.

Of cultivated crops, roots occupy a prominent place, being grown for feeding purposes. The preference is given to mangels, and a large field by the roadside gave promise of an abundant harvest. Tobacco is also raised to some extent, and is about the only crop sold from the place. The objective point, however, of all cultivation is to put the land in condition for grass. Grass is king here, and to its needs and interests all other crops are subordinated.

Probably there are few farmers in the State who would desire to copy, in all respects, the model here furnished; yet we believe there are many who would find in some features of Mr. Colt's admirable arrangements, valuable suggestions for the improvement of their own.

The farm of James B. Olcott is situated about two miles from the village of South Manchester.

I attempt a description of it with a feeling of despair on account of my inability to show the place to my reader as it appeared to me on the occasion of our visit. I will not attempt a detailed description of the farm and its operations, but dwell instead upon a few of its salient features, advising those of my readers whose curiosity may be aroused, but not satisfied, to go and see for themselves.

Coming upon the place from any other point of departure than South Manchester, the absence of any fence about the house-lot would attract particular attention, but South Manchester itself is fenceless, and coming from there even a fenceless farm did not seem strange. But Mr. Olcott's farm is not entirely fenceless, only the house-lot, of about fifteen acres, being without this protection. This tract is a sort of natural park, comprising woodland, lawn, and garden, some of it in all its native wildness; cleared spaces here and there in use for garden purposes, and about the buildings the wild growth crowded back somewhat by a smooth and ample lawn surface. The surface of this plot is undulating and the soil light and sandy; still its texture is very fine, and it possesses in a good degree the power of retaining moisture. It produces well when well fertilized and cared for, but it will not stand neglect and robbery.

The buildings upon this farm, I am sure, were not modeled after any pattern existing upon this continent. "I live in a barn," is the proprietor's statement, but I think a more accurate one would be that his cows live in a house. It is true that both eat and sleep under the same roof, but the regard for neatness, comfort, and all the conditions of health is much more characteristic of house than of barn. The cow stable is separated from the parlor by only two intervening rooms, but no parlor in the land is purer or sweeter than this. It is not to be understood, however, that Mr. Olcott intends the present arrangement to be permanent or recommends it for general adoption; but he has clearly shown that where one's circumstances render such an arrangement desirable, it is entirely practicable to obviate any objections on the score of neatness. And having shown this, he has shown also that it is entirely practicable to make neatness and purity the rule in our barns when not closely connected with our dwellings. And is there in all our farm practice a point which more generally needs improvement than this? Do not some even of *good* farmers habitually keep their domestic animals, pigs, cows, sometimes even horses, in stables inexcusably foul? None of our domestic animals are by nature filthy. As much as ourselves they want pure air to breathe, pure water to drink, and wholesome food to eat. Mr. Olcott maintains and cites his own practice and its results as proof that neatness is not only entirely practicable, but also economical; that filthy practices are wasteful and an offence against our pecuniary interests as well as against our finer sensibilities.

The means by which Mr. Olcott keeps his stables and yards pure and sweet are simple and easy. Dry earth, frequently and freely applied, is the prescription,—warranted never to fail, if faithfully and thoroughly tried. In his case, the trial is faithful and thorough and the success complete.

Mr. Olcott's farm is mainly devoted to the production of small fruits and garden vegetables. Owing to carelessness in taking and preserving memoranda, I am not able to state accurately the extent of his operations, and I fear this report will not have much statistical value. But the character of any person's work is of more value to learn from than its extent; and all of Mr. Olcott's work has a character of its own.

The distinguishing characteristic of his cultivation is its thoroughness. Through and over the strawberries and raspberries; the sweet corn, turnips, squashes, and beans; the early crops and the late crops alike, the eye sought in vain for a weed,—that is, my eye did; but the better trained eye of the proprietor hunted the enemy under leaves and behind stalks, and wherever found dragged him forth to instant destruction. No errand so urgent, no work so pressing, but it might be interrupted to prevent a weed from maturing its seed. The amount of culture a crop or field received was the amount necessary to thoroughly exterminate its weed crop, whether it required going over three or twenty times. Alike in the broad field and the small garden patch, that "eternal vigilance" which is the price of freedom from weeds, wrought and earned its great reward. No plant food, either of soil or fertilizer, was diverted from its appropriate mission, to grow and perpetuate a crop of weeds. Even "pusley," that omni present pest of garden and field and the despair of most cultivators, was here sternly and effectually repressed. The victory was complete, and though not easily won, was, we fully believe, worth all it cost. Can the results so conspicuous in this case be made the rule, rather than the rare exception, among farmers?

There seems no inherent difficulty in the matter. Very many farmers fight as hard a battle, to meet with utter defeat, as Mr. Olcott does to win a complete victory. One great secret of effective work in this line is to take it in season. The labor required to kill a hundred weeds well grown and firmly rooted, will kill ten thousand when just sprouted. It is easier in every respect to go over a field three times when weeds are in the earliest stages of their existence, than once after they become firmly established. Another point of much importance is, a proper arrangement of the crop, and the use of suitable implements. Mr. Olcott's practice is to plant everything, where practicable, in drills, straight as a line can be drawn, thus greatly facilitating culture either by hand or horse power; while his assortment of implements for hand culture was a genuine curiosity. It reminded one of a dentist's case of instruments, so carefully was each implement adapted to some special service. There were hoes to pull and hoes to push; hoes with straight edges and hoes with serrated edges; hoes to cut shallow and hoes to stir deeply; hoes of his own devising and hoes of other people's invention; hoes that were just right and hoes that needed a little twist here and a shaving more or less there to make them just right. Noticing this careful adaptation of each to the special work required of it, one was ready to give them some share of the credit of the efficient work in their line which is seen upon this farm. "But," asked one of the visitors of Mr. Olcott, "do you take all this set of implemtens along with you when you go to work?" "Only what I shall be likely to need," was his reply. "I generally know about what the character of my work will be, and do not often have occasion to take more than three different tools along."

No description of Mr. Olcott's place would be complete which omitted to notice the exquisite order maintained in field, barn, and shed. "A place for everything, and everything in its place," is the motto, and it is lived up to. Just at the entrance of the main field, a large shed, open on one side, furnishes shelter for carts, wagons, plows, harrows, and all heavy field implements, while in the work-shop part of the house each tool had its appropriate place, which when not in use it was expected to occupy. "But how would you manage," inquires our critical Secretary, "if you had to depend upon green foreign help?" "I'd make it easier and handier to put things where they belonged than anywhere else. I would'nt have any other place for them," responded Mr. Olcott, in full apparent confidence that he would be able to manage even that tough problem. And I rather think he would.

I ought not to close this account of Mr. Olcott's place without noticing the unusual beauty of his homestead and its surroundings. Though spending but a few hours of daylight there, it remains in my memory a clearly defined picture of a very attractive home. It has been made so by studying nature and accepting her suggestions. The location of the buildings is elevated but sheltered. In the necessary clearings for lawn and yard, the larger trees have been left and as little violence as possible has been done to nature's arrangement. In return for this deference to her, nature gives a finer park than art can create. It is a pity that so cheap a beauty as this is not better appreciated and more sought for. We who are with nature so much, ought to know her better than we do. We ought to know her, not merely as a bountiful provider, but also as artist and architect; not merely as the nursing mother, but also as the teacher of mankind. Her teachings may seem obscure, but they are unerring; and as we study her, we shall find that her apparent obscurity is in reality our own blindness. We need to study her more, as well in her aspects of beauty as of bounty.

In company with Mr. Olcott, we made a brief call upon one of his neighbors by the name of Buckland, who owns a farm of about one hundred acres. He raises yearly about two acres of tobacco, which is his principal cultivated crop. A broad meadow, too wet for profitable cultivation, was kept in grass and its fertility maintained by top dressing. Some of the wetter portions had been greatly improved by judicious draining, and at the time of our visit, we found Mr. Buckland engaged with mattock and spade straightening and deepening the channel of a sluggish little stream to afford better drainage for a level wet tract now in pasture. This locality produces tobacco of excellent quality, and Mr. Buckland informed us that tobacco and hay were his most profitable crops. His whole farm and its appurtenances gave evidence of good management.

In the afternoon of our day at Manchester, our friends, Olcott and Buckland, took us upon a tour of observation through the villages and neighborhoods in the eastern and northern portion of the town. The character of the soil gradually changed from the fine sand, which predominates in the vicinity of South Manchester, to one of heavier and stronger texture, with less of pine and more deciduous trees in its forest growth. We began to find apple orchards of vigorous growth and apparent fruitfulness, a feature conspicuous by its absence on the sands of South Manchester. It was interesting to note the spread of the contagion of fencelessness. The village of South Manchester, it is well-known, is without fences, and for two or three miles in every direction many fields were cultivated without this protection. The practice seemed to be spreading; and while it is not proposed here to express an opinion in regard to the general abandonment of fences, or to argue the question at all, it is gratifying to see it put to the test of experiment on so extensive a scale.

Throughout all this region, Tobacco is the king to whom the farmers pay the tribute of their choicest acres, their costly and abundant fertilizers, and their diligent and unsparing labors, and to whom they look in return for nearly all their money income, with all those privileges, comforts, and luxuries that money brings. But we did find one man who refused to bow the knee to this tyrant. Mr. Joseph Woodbridge, of Manchester Green, was this rebellious character. His farm is situated in a beautiful valley, where almost every acre can be overlooked from his dwelling. Our visit was in the second week in September, and we found Mr. Woodbridge harvesting a crop of corn, which it was good to see.

The question of corn *vs.* tobacco, was argued briefly, Mr. Woodbridge maintaining the cause of corn with ability and earnestness. And indeed at the time this report is written (February, 1876,) his arguments seem far more forcible than when they were uttered. One of Mr. Woodbridge's strong points against tobacco was, the great uncertainty always involved in its culture and sale, and the consequent anxiety and worry imposed upon those who tie their fortunes to this crop. Just at this time I think this point would be widely appreciated.

Our day at Manchester was spent very pleasantly, and we hope profitably. To our friends, Olcott and Buckland, and to the Cheney Brothers, whose place is reported on by Mr. Day, the visiting committee are under great obligations for their hospitalities and kind attentions.

BLOOMFIELD.

The farm of Josiah Capen is situated in the town of Bloomfield near its southwestern corner. It contains two hundred and fifty acres, of which one hundred and fifty are in one compact parcel, upon which are situated the dwelling house, barns, tobacco sheds, and other outbuildings of the farm.

The management of the farm is in the hands of Messrs. J. C. and G. F. Capen, sons of the proprietor. About forty head of horned stock are kept, of which one half are usually milch cows. The milk is sold on the place by parties who supply the Hartford market. The price received is usually four cents per quart in summer and five cents in winter. A powerful and well trained team of oxen is always kept, but at the time of our visit were employed at a distance from home, so that we did not see them. The fame of Bloomfield cattle is wide-spread, and the Capen brothers do their share toward maintaining it. Of the ten head of horses upon the place at the time of our visit, one splendid pair of workers were in service as a farm team, the balance being driving and breeding stock and young animals. The breeding stock is of good blood for producing good carriage horses, with a chance of developing sufficient speed to give value for the race course. The Capen brothers are very frank in the statement that the breeding and rearing of ordinary horses does not pay in Connecticut, but that is not the kind of stock they propose to raise.

Of cattle, the Short-horn head is in favor upon this place, both for milk and work. Of this fine race they have some splendid specimens, both pure bred and grades. There are also a few animals of other breeds, which are usually obtained in the way of trade. Indeed the stock upon this place is almost constantly changing through the vicissitudes of trade.

For the Messrs. Capen being skilled in breeding, rearing, and training stock of all kinds, find it profitable often to dipose of these thoroughly developed and carefully trained animals for the extra prices they will readily bring, and buy and train others to supply their places. With very few, if any exceptions, every animal upon the place has its price, and one at which sales are very frequently made.

Of cultivated crops tobacco is the chief, the amount raised varying from five to seven acres. Bloomfield tobacco is usually of good quality and brings a high price. The wrappers of the 1874 crop on this farm brought the extraordinary price of fifty-five cents per pound. In favorable seasons their crop has averaged one ton per acre.

With the Messrs. Capen, as with all good farmers, one problem ever pressing for solution is this: How to maintain and increase the productiveness of their soil. Such crops of tobacco as they grow can only be produced on the best of soils, most lavishly fertilized. One rule of their's is to consume upon their farm all the hay it produces. Straw is sometimes sold but hay, never. Well arranged basement stables enable them to preserve their manure from waste, and the amount made is very great. In addition to this they have usually purchased large quantities of horse manure in Hartford and hauled it a distance of six miles to their farm. Horse manure is considered especially suited to produce a fine quality of tobacco, and with the prices which fine tobacco has commanded for a term of years, it has been considered profitable to procure it even at the disadvantage of so much hauling. But I am very much afraid that if my friends, the Messrs. Capen, sell their crop at the present ruling prices, they will be compelled to figure very closely to find where the pay for hauling manure six miles is to come from. It may be said, however, that in farming, no more than any other business, can it be expected that every year's operations shall be profitable. The business must be judged by the results attained for a term of years, and judged by this rule the business of the Capen brothers is clearly a good one. Evidences of successful management abound on every hand. The buildings are ample, well arranged, and in good repair; the implements are of the most effective design and construction, and as I have elsewhere indicated, the teams are superb. The general appearance of the place, the promptness and thoroughness with which the work is performed; the thrifty condition of all the farm stock and the whole movement of the business, prompt and strong, but without hurry or fret, impresses the observer with the idea of a business well understood, well managed, and successful. I should specify the grounds of this success about as follows: First, a good soil. The whole of the western portion of the town of Bloomfield, from the foot of the mountain range that bounds it on the west to the great plain that occupies much of the eastern section, is of extraordinary native fertility. It is quite undulating, consisting of a succession of low ridges running parallel to the mountain ridge on the west. There seems to be very little out-cropping rock in these ridges, and they are fertile and easily cultivated to the summit. Some of the intervening valleys are wet and difficult of drainage, but on the Capen farm this is true only of one, which is situated on the western border of their tract. In this valley is a muck bed of vast extent, which they have begun to develop and hope to find valuable. This farm includes no hungry soil. When fed it fattens, and its fatness is gathered in successive and abundant harvests.

Second. A good market within easy reach. Their proximity to the city of Hartford enables them to dispose of the product of a milk dairy at fairly remunerative rates. They are thus enabled to stock their farm as heavily as may be desired. The direct returns from this source may not be very large, but the indirect return in the shape of a large quantity of rich manure lies at the basis of much of their income from other sources. Many other farm products can be marketed to better advantage by reason of proximity to a city of the size of Hartford, and purchases of stable manure, fertilizers, implements, and every thing needed for the farm can be made with the advantage of large stocks to select from, and with a minimum expenditure of time and trouble.

Third. A wise adaptation of their business to their circumstances, tastes, and capacities. I think this the chief reason for their success. Agriculture is a very comprehensive work, certainly not less so than manufacturing. Now, in manufacturing, a man who has great skill in making textile fabrics might ignominiously fail in the conduct of a machine shop or an iron foundry. And even if engaged in the business for which his tastes and skill fitted him, he might fail if his location was unfavorable. In the same way, one qualified by nature and training for a market gardener would be very likely to fail in charge of a stock farm, and vice versa. "There are diversities of gifts," and the man who would win success must consider well his own qualifications as well as his sources of supply, his market and his capital. By a wise combination of these conditions, success is placed within his grasp. In the case of the Messrs. Capen their tastes and training gave them superior qualifications for managing a stock farm. They are not breeders merely, but trainers and dealers as well; and I should judge that the buying and selling of stock of all kinds was an important and profitable branch of their business.

An abundant supply of small fruits for family use was grown in the garden, and a thrifty young orchard occupied a place upon the summit of one of the hills. But the production of fruit for market does not enter into the scheme of these gentlemen. It would seem that their situation was favorable, but their tastes do not incline in that direction, and they have enough else to occupy their time and attention pretty thoroughly. After looking over the Capen farm as thoroughly as the time at our command would permit, we made a rapid tour of observation through the western portion of the town, making brief calls at the farms of Martin Burr, James L. Prosser, and S. B. Pinney. Our observations were too limited to enable us to attempt any description of either farm. We were attracted to the places of Messrs. Prosser and Pinney by their exceptionally large and fine barns. In both instances we found that the supply of milk to the Hartford market was a leading interest, and wherever this is the case, ample and well kept barns are to be found. But Mr.

Burr, while keeping a herd of cows, chose to market his milk in the form of veal. Among so many milk sellers, calves, a few days from birth, are plenty and ordinarily of no value. Mr. Burr keeps his cows employed in fattening calves thus procured throughout the season, and he seemed entirely satisfied with the returns he received, while he escaped much of the objectionable labor and confinement connected with a milk dairy. Mr. Burr accepted the favorable impressions of the committee in regard to the agricultural resources of Bloomfield as correct, and expressed himself to the effect that if a man couldn't do well on a Bloomfield farm the fault must be with himself. Our tour through West Bloomfield took us quite near the foot of the mountain, and the vigorous appearance of the apple orchards at its foot and upon its slope was very noticeable, showing this region to be especially favorable to fruit culture. Crossing to the eastern portion of the town, we called at the farm of Norris Holcomb, Esq., but in consequence of the absence of Mr. H. from home our observations upon his place were not extended. The texture of the soil here is very different from that in the western portion of the town. It is far lighter; in some places quite sandy and apparently much less productive. The surface is more nearly level; indeed, over a very extensive tract reaching nearly to Mr. Holcomb's place, there was hardly sufficient inclination to afford drainage for the soil. Whatever the agricultural capacities of this tract may be, very little has as yet been done to develop them. Mr. Holcomb's farm is upon higher land, naturally well drained and well cultivated. Mr. H. keeps a fine herd of thoroughbred Jerseys and makes butter instead of selling milk. We are not able to give any statement of productions or profits from this farm.

The committee are indebted to their Bloomfield friends, and especially to Mr. J. C. Capen, for abundant hospitality, and such assistance and information as enabled them to discharge the duties of their appointment pleasantly, and as we hope, successfully.

The TOWN OF EAST GRANBY, which was next visited by your committee, lies to the north of Bloomfield, but extends farther west and includes territory on the other side of the mountain range. The principal part of the town, however, lies east of the mountain, and it was here that most of our observations were made.

The principal street runs in a direction nearly north and south along the summit of a low rounded ridge, the first well defined and continuous one from the foot of the mountain. Along this street the houses and homes of the farmers were located, while the farms, with a uniformity of lay-out rarely found these days, extended westward across the intervening valley and up to the summit of the mountain ridge. In many cases they also crossed the street and included a portion of the next valley to the eastward. In both of these valleys the drainage was very imperfect, the inclination of the surface being hardly sufficient to set the water in motion. Indeed we found in one instance adjoining proprietors holding directly opposite opinions as to the direction in which the water ran across their premises. These low lands were generally devoted to pasture, as were also the mountain slopes to the west, while the lands upon the ridge on both sides of the highway were kept in cultivation. The advantages of this arrangement were so obvious that it was almost invariably adopted. It brought the fields upon which the greatest amount of labor was to be expended, in close proximity to the dwelling and barns, while the pastures were still convenient and easy of access. They were also abundantly watered.

Of farm products relied upon for a money income, tobacco holds the first place. Its culture has been very profitable, as the tobacco produced here is generally of superior quality and brings good prices. The opinion is entertained, and high authority is given in support of it, that a trace of copper found in the soil, and derived probably from the vein of copper ore which crops out on the other side of the mountain, affects favorably the quality of the tobacco grown here.

Dairy products also form an important item of production and sale. Butter is the chief article in this line, and it is marketed both in Springfield and Hartford. East Granby being about equidistant from the two places, it is a little too far from either to admit of supplying milk to customers there; the distance is also too great to admit of hauling manure from thence with profit.

Being thus compelled to depend upon home sources of supply, more domestic animals are kept, and with more especial reference to this point. In regard to the management and application of manure derived from this source, a considerable difference of opinion was manifested even among good farmers. For instance, Mr. B. E. Viets, an energetic and successful farmer, placed a high valuation upon muck, from the beds which are abundant and convenient in the level valleys on both sides of the street, for use in composting. He made use of this article very freely, and intended to have his compost made six months or a year in advance of the time for using. The general excellence of his crops and success of his operations furnished a strong argument in favor of his philosophy.

Yet some of Mr. Viets' neighbors, also intelligent and successful farmers, while conceding to muck a certain value for absorbing the volatile elements of manure, and extending fertilizers, were in doubt if it paid for digging and hauling; and preferred to apply their manure fresh from the stable and yard. They thought Mr. Viets' success the result more of his thoroughness and unremitting industry, than of the muck he used.

On some other points of interest and of practical importance we found gentlemen of superior intelligence holding opinions diametrically opposite. Thus in a discussion upon the general subject of tobacco culture, at the house of Mr. Charles P. Clark, and mainly between himself and Mr. B. E. Smith, Mr. Clark maintained that hay grown after tobacco was deficient in nutritive qualities, and of course in value. Mr. Clark's position was in general adverse to the tobacco crop as a leading and permanent farm product. He charged it with being a great and peculiar robber of the soil. He believed that it took something from the soil which our present knowledge of agricultural science and the supplies of plant food at our command, did not enable us to replace.

"Other conditions being equal," he affirmed, "the first crop of tobacco from any piece of ground is the best." Mr. Clark maintained his positions with earnestness and ability, but did not succeed in convincing his opponent. To your committee his statements and arguments, while striking and worthy of serious consideration, did not seem conclusive. Indeed, the laws which govern the phenomena involved in the discussion referred to, are so obscure in their action that the observation of the ordinary farmer, however intelligent, is insufficient to detect and determine them.

To one of your committee who had devoted considerable time and thought during the past two years to efforts for the establishment of an Agricultural Experiment Station, the discussion was especially interesting, as bringing up a class of questions of direct practical interest to farmers in the solution of which that institution can render very great assistance.

The farmers of East Granby are intelligent and observing. They maintain a live farmers' club, and it was interesting to notice the frequent allusions to its discussions and citations of facts and arguments brought forward in its meetings. But it was to be noticed that in the class of questions heretofore indicated, a fact on one side was apt to be met by a fact on the other, and the discussion, however able and interesting, settled nothing and convinced no one. But let the observations of the farmers be supplemented by the experiments of the Station, where the conditions shall be carefully devised to carry results already attained one step further into the unknown, and those conditions rigidly controlled from beginning to end, so that the bearing and weight of the result may be definite and unerring; then genuine progress will be made.

To return to East Granby agriculture. Fruit receives considerable attention, and the conditions would seem to be favorable for its successful culture. It was the off year for fruit and but little was to be seen in the orchards, although the general appearance of the trees was healthy and vigorous. Especially was this the case with some young trees upon the farm of Mr. B. E. Viets before mentioned. One of Mr. Viets' ideas in regard to the management of an orchard was, that a plow had no business there. The trees were cultivated, but by other agencies than the plow. A circle perhaps six feet in diameter about the trunk of each tree was kept well spaded up and received a liberal application of manure, the remainder of the space being left in grass. Whether or not his method is the best one, the condition of his trees left no doubt of the fact that it is a good one.

In addition to the crops already mentioned and which are raised with a view of being sold, East Granby produces largely of those crops which are designed more especially for home consumption. The goodly numbers of domestic animals to which I have before referred, involve the necessity of consuming upon the farm most of the hay crop produced. Fields of corn were frequently observed, and potatoes seemed to be cultivated quite largely; and of all these crops the uniformly good appearance was remarkable and very gratifying. Of the farms visited in this vicinity, that of Mr. B. E. Smith received perhaps more of the committee's time and attention than any other. Besides possessing in a high degree the excellent features of situation and management which characterize the locality, the pastures belonging to this farm, and situated upon the slope of the mountain, were noticeably more fresh and luxuriant than those upon either side. Inquiring for the reason of this, the owner told us that his practice differed from that of his neighbors in that he never plowed his pastures and was careful not to over-stock. He valued very highly the sod formed of native grasses, and thought it far better to nourish and retain them, than to plow them under, to rot and fertilize a crop of grain and coarser grasses.

Besides the persons already mentioned, we made brief calls in our journey through this part of East Granby upon Mr. Benjamin P. Clark, Mr. Carlos Bates, and Mr. William Gay, and perhaps others whose names have not been retained; but neither time nor space is at command to give a particular description of each place; and as before remarked, the situation was so remarkably uniform that a general account of one place would answer for all.

Leaving the ridge of land upon which these observations had been made, we passed eastward across the valley and a second ridge of somewhat similar character to the first, and reached the East Granby plains.

These plains stretch out for miles, a level sandy tract, in part occupied by a growth of scrubby timber but largely bare of any vegetation, save once in about five or six years, when it is thrown into broad ridges and planted with corn, the hills being about five or six feet each way. When the corn is well started in growth an additional furrow is thrown towards the ridge on either side, and that is all the cultivation it gets. The crop ranges from six to ten bushels per acre. A rye crop often follows the corn, yielding perhaps five bushels per acre, and then the land is allowed to rest for another term of years. Under this system, if such it may be called, no fertilizers of any kind are applied. I have called the soil sandy, and yet it is by no means all sand. There seems to be a considerable admixture of loam and the texture is fine and soft. Nor does it seem to be deficient in its supply of moisture or its power of retaining it. And yet the only improvement made of it is that which I have described; and its market value ranges from five to ten dollars per acre. Evidently the problem of its profitable cultivation is as yet unsolved.

Our visit to it was for the especial purpose of examining one attempt at the solution of this problem. Mr. Charles H. Clark, of East Granby, had a few years previously purchased a tract of land upon these plains with a muck bed adjacent, and he is pursuing a different style of cultivation from that heretofore described. His chief dependence for fertilizers was upon fish scrap composted with muck. This was liberally applied and good crops were harvested. He had raised tobacco, rye, and grass, to all appearance profitably. Certainly he did succeed in securing a very satisfactory growth of all these crops. And yet it was evident that he had not inspired confidence in those long familiar with the situation that these plains could be profitably cultivated. No one followed his example; the market value of the property was not enhanced; and the prevalent opinion seemed to be that his attempt would before long be abandoned. To the eyes of the committee, the results attained by Mr. Clark seemed very encouraging, and whether success or failure is the final outcome of his experiment, he is to be commended for an earnest attempt at the solution of this problem which, if successful, would yield very beneficent results. We find it hard to reconcile ourselves to the conclusion that a large tract of land, so favorably situated and possessing in an extraordinary degree many of the conditions of profitable culture, must for ever remain a desert waste, worthless and unproductive. Mr. Clark may not have the key to the solution of this question, but we believe it is yet to be solved, and whoever reaches its solution will be helped by Mr. Clark's experiment. A score of experiments with only negative results would be well repaid by the one positive affirmation which would show the way to the right treatment of these lands.

Crossing to the west side of the mountain, the committee called at the farms of Mr. Chauncey E. Viets and Messrs. A. and D. Phelps, but at neither place were the observations sufficient to enable us to give a detailed account of farms or farm operations. In general, it may be said that farming as conducted here is less concentrated and intensified than that east of the mountain. Less tobacco is raised, more live stock is produced and sold, and the conditions of the business generally seemed more like those which prevailed twenty-five years ago.

If I am to tell the whole truth, I fear that I must confess that on this trip the attention of the committee was somewhat distracted from agricultural matters by encountering the ruins of Newgate Prison; and the temptation to explore a place of so much historical interest was too great to be resisted. But unless the copper in the soil, to which the East Granby farmers attribute the excellence of their tobacco, will answer that purpose, it is difficult to find any link of connection between these explorations and agricultural interests. And so I leave their story untold, merely advising my reader that if ever a purely agricultural errand brings him to East Granby and his route lies over the mountain and past the ruins of Newgate, let him not miss the opportunity of exploring a place of so great interest and (for this country) of such hoary age.

The committee are under special obligations to Messrs. Charles P. Clark and B. E. Smith for hospitalities and kind attentions.

All of which is respectfully submitted.

J. M. HUBBARD, *Committee.*

REPORT OF COMMISSIONERS ON DISEASES OF DOMESTIC ANIMALS.

To the Board of Agriculture:

Gentlemen: I submit in the briefest manner, in behalf of the Commissioners on Diseases of Domestic Animals, my report, as this subject has been so freely treated in your previous reports. We are gratified to be able to say that we have suffered from the cattle plague but very little in our State the past season. There have been but few calls on your committee. The most noticeable is that from Somers. E. Collins and A. Fuller purchased, August 6th, twenty head of western steers at Albany, N. Y., of parties from the west. August 9th one died; five were sold for beef, one of which died on the way to Ellington, about six miles. The next Saturday, the 14th, eight more were buried. In all eleven died and all were sick. So again in our county, by the way of Springfield, Mass., we had spread among our cattle the real Texas fever. We are pleased to say, so far as our knowledge goes, it spread no further among our cattle. The ticks were found on all of these. The natives seldom, if ever, communicate this disease to native cattle again. It is but just to say, when I called on Mr. Collins, he acknowledged the existence of the disease, was perfectly frank, concealing nothing, and was imposed upon, as he says.

I desire to express, on behalf of the Commission, thanks to the railroad officials for their kind offices in behalf of this work, and promoting the cause of agriculture.

E. H. HYDE.

GENERAL REMARKS.

While our flocks and herds have been free from any wide spreading and fatal plague, and general thrift has prevailed, yet the total amount of loss, if it could be ascertained, would astonish us. We pay a heavy tax for our neglect and ignorance. Numerous cases of preventable disease, and from unknown causes, have come under our observation.

Abortion in cows still threatens our herds, being mostly observed in cases of cows brought into the State from localities where it prevails. Our dairymen cannot be too cautious in purchasing cows whose full history they cannot obtain.

Glanders has had an occasional victim. The *use* of these poor brutes is of no value in comparison to the risk incurred by man and beast from their presence, and they should be killed immediately when the nature of the disease is known.

Horses were again afflicted with a mild epizootic, which required special care and generous diet, but was unattended by fatal results.

Phthisis, considered more or less hereditary, and in some degree contagious, still lurks in some herds, and should be carefully watched, as its end is as fatal as its progress is slow and insidious.

Milk fever and black leg, as well as sudden death from unexplained causes, have, in their usual degree, afflicted our neat stock. In these cases the nature of the disease is not known at all, or till too late for successful treatment. More careful study into all the conditions of health and disease among our farmers will do much to prevent these now considered inevitable losses.

T. S. GOLD.

REPORT OF DELEGATES ON FAIRS.

NEW HAVEN COUNTY.

Milford and Orange. The fair was appointed for Wednesday and Thursday, September 6th and 7th, but owing to bad weather on the 7th it was adjourned to the 8th. This society have purchased a new location, called Meadow Side, and graded a half mile track, which was used this fall for the first time. The unfavorable weather was very discouraging, as usual, but the energy and courage of the exhibitors were not subdued, but worthy of all praise.

GUILFORD. The Guilford agricultural exhibition was held October 13th. The day was splendid and the attendance very large. Music Hall was filled to overflowing with a great variety of fruits, flowers, grain, vegetables, and other articles.

The stock exhibited was very fine. I mention as specially worthy of notice a choice lot of young horses by Rev. Wm. H. H. Murray, of Boston, who has a farm in Guilford; an extra fine Devon cow, by the President, Hon. Wm. W. Fowler; a pair of five-year old oxen, owned by John Hubbard, weighing 4,413 pounds; a pair of two-year old steers by Robert E. Davis, weighing 2,970 pounds; six pairs of fine oxen by Mrs. G. Chittenden; sixty-nine pairs in all, and one well trained odd ox. A great variety of fowls were shown in fifty-three coops.

An address was delivered by the Rev. Wm. H. H. Murray, and yielding to the earnest solicitation of the President, your delegate ventured a few remarks. A band of music enlivened the scene and added to its attractions.

A. L. AVERY, *Delegate.*

NEW LONDON COUNTY.

On the 14th of September I visited the New London County Fair, held on the fair grounds at Norwich.

The exhibition of working cattle was very good in numbers, most of them choice, well made, of good size of their various ages, and well trained, as shown by their several trials on the cart and stone drag.

There was a very large exhibition of stock, comprising the different breeds of thoroughbreds, most of them good animals, and some of them very fine and superior.

The exhibition of stock by the Hon. James A. Bill, consisting of about fifty head, the larger part of them Devons, fine animals of that noted breed; also, his exhibition of sheep was an interesting feature of the fair.

There was a good show of grade cattle and cows, many of them useful animals for the farm.

Horses were in goodly numbers, some of them very fine, but owing to my not being at the fair on the day of their exhibition, I had only the opportunity of seeing them in their stalls.

The show of sheep was large in number, some of them well made, well wooled, good sheep; but as a general thing the farmers of the county have given up keeping sheep, having so much trouble from dogs, as I learned by inquiry. This is the report from most all parts of the State, that this good, useful and paying stock for the farm is being almost entirely sacrificed for the support of an almost entirely useless animal.

There was a good show of swine, some of them very fine ones, as also of poultry of the various so-called improved breeds.

In the building on the fair grounds was a display of fruits, consisting of one hundred and six plates of various kinds of apples, which were of good size, fair, smooth looking fruit of their kind; seven plates of very good peaches; three plates of very large, fine quinces; sixty-three plates of pears, which were large, fine, highly colored, excellent looking specimens; eighteen samples of canned fruits, which, altogether, made a very attractive display.

Eighteen samples of bread, very light and fine looking, harmonized with the show of dairy products. These were of excellent quality, and the arrangements for keeping were superior, consisting of a large glazed case with ice in the bottom and slats over the ice, on which the several samples were placed and kept cool, free from dust and air, and in the best condition.

There was a good exhibition of vegetables, consisting of a large number of squashes, cabbages, turnips, carrots, etc., which were large and fine of their several kinds. Potatoes were fine of the various varieties, as regards shape and size, among them the new Snow-flake, shown by Mr. J. P. Barstow, of Norwich, part of the product of one bushel of seed planted, the yield from which was sixty-six bushels of good sized potatoes; those on exhibition were very uniform in shape, large in size, smooth, fine looking potatoes.

A good show of stoves of various designs, for heating and cooking, attracted a great deal of attention, as also a fair display of agricultural and other implements, and machines of good appearance.

There were only a few flowers, but an abundance of quilts, with numerous kinds of fancy needle work.

Owing to my limited stay at the fair, I did not have the time to see all that was to be seen, and many things worthy of notice in this report must have escaped my attention.

My thanks are due to the officers of the society and to other members present for many favors during my short stay at the fair.

H. L. STEWART, *Delegate.*

LITCHFIELD COUNTY.

UNION SOCIETY—FALLS VILLAGE. The morning of the 7th of September opened brightly upon the beautiful valley of the Housatonic with its picturesque scenery of abrupt, conical and lofty hills encircling the plot of ground admirably selected for the exhibition of the society. The day was as perfect as could have been desired.

Early in the morning fine selections of stock, thoroughbred and grade were gathered within the show grounds. The number and variety of cattle were quite large, embracing some rare specimens of various kinds of thoroughbreds; as many nicely formed animals for breeding purposes as are generally on exhibition at similar fairs. The stock gave evidence of good breeding, care and attention, and would, in our opinion, compare favorably with that in any part of the commonwealth. There were between thirty and forty pairs of working oxen on the ground, some of which were extra large and well formed and well trained—all were good. The trial of draft cattle on the stone boat demonstrated the muscular power of the ox admirably. There were forty pens well filled with good stock grown by the farmers of that section, manifesting the deep interest they have in raising animals of first quality.

Careful and judicious breeding and rearing for themselves is the only way to insure success.

The exhibition of sheep was very creditable. There were some very nice fine-wool sheep, also Cotswold's and South Downs.

But few swine were on exhibition. These, however, were good.

There was an interesting exhibition of fruit. It was too early in the season for a good show of apples, especially late varieties; however, the display was good for this year. The pears, grapes, plums and peaches were well selected, giving evidence of discriminating taste and assiduous culture.

The show of grain and vegetables was not large, but the quality was particularly fine.

A very favorable exhibition, as we had reason to expect from that region of cream, was made of dairy products. There were from sixteen to twenty packages of butter and ten or twelve specimens of cheese. All presumed to be very good, having that outward appearance, but not tested.

Bread was exhibited in profusion.

The exhibition in wax flowers, embroidery, oil paintings, mottos, carpets, quilts, etc., was highly creditable to the ladies of that part of Litchfield county, showing that they can combine the elegant with the useful, the ornamental and the beautiful with the more necessary qualifications of the mind. The floral exhibition exceeded anything of the kind that we have seen at any fair in our State. It was elaborate and splendid.

The exhibition of horses and colts on the second day was quite gratifying, showing that the farmers of the northwest corner of the State are in earnest in their attempts to improve this class of stock. Probably the show of colts from the suckling to three years old or over, was as good as at any county fair in the State.

SAMUEL F. WEST, *Delegate.*

TOLLAND COUNTY.

The annual cattle show and fair of this society, held in Rockville, was a success in most of the departments, in the number of spectators and financially.

The show of cattle was not as large as it ought to have been in a county where so many valuable ones are kept.

I noticed some valuable thoroughbred Ayrshires, Devons, Durhams, Alderneys and Dutch cattle, and most of the grades were superior animals, the cows showing good milking qualities, evidently an improvement upon earlier exhibitions of the society.

The working oxen were in good condition, generally well matched, and showed good training and great strength.

The horse interest here, as in most counties of the State, seems to be in the ascendant, and the exhibition of them, when conducted in the quiet, civil way that it was at this show, will be productive of no small benefit. The horses in Connecticut are not up to the standard of excellence they ought to be, and every encouragement should be offered to make them better. Where one person is found who is not an admirer of well formed, kind, and intelligent horses, hundreds are found who are admirers of them.

Eleven pairs of matched horses competed for the society's premiums and for exhibition, and the display was excellent. The trotting was spirited, well conducted, and, as usual on such occasions, witnessed by an admiring crowd of spectators.

The fruit of all kinds was nice, and made a beautiful show for a non-bearing year. Some choice pears of the best varieties added much to the show, and should be cultivated to a much larger extent in a county so well adapted to fruit growing as many sections of this county. No one should be without the "family pear orchard," and no investment will pay so readily or afford as great luxuries with so small expense as the well kept orchard.

The vegetables were in abundance; cabbages of mammoth size, turnips, beets, onions, squashes, etc., in profusion. Many of the new and popular kinds of potatoes, smooth and nice looking, were exhibited, and noticeable among them were six varieties of new seedling potatoes, grown upon the farm of Ex-Governor Hyde. Five of the varieties give promise of being very valuable for the table or general cultivation.

But little attention is paid to cheese making, and the exhibition in that line was small. Seven parcels of butter were shown, most of them extra nice and very creditable to the fair hands who made it; beautiful in color and flavor; some of it a little too salt to suit a connoisseur, and one parcel evidently very nice before it was put into a box previously used for some other purpose.

Better arrangements should be made at the Fair for keeping butter cool and in perfect order, as taken from the dairy. A box sufficiently large to hold all the parcels of butter, and supplied with ice, can be easily made for this purpose, and thus please and increase the number of exhibitors of this article.

In the floral, household and miscellaneous departments were many contributions of useful and ornamental articles, rich, rare and lovely, tastefully arranged, evidences of unwearied patience and good taste.

ALBERT DAY, *Delegate.*

Brooklyn, September, 1875.

REPORT OF HON. E. H. HYDE.

To the State Board of Agriculture:

Appointed by you as Vice-President of your Board to visit the fairs in the State at large, I have the pleasure to report briefly. The members who were especially delegated for this work will report in detail.

The second week in September last, I visited the New London County Fair, held on the beautiful park at Norwich. This is one of the successful societies in the State,—perhaps it is the most so. It has a very large exhibition of stock. Its hall is one of the largest, and it was well filled. The show was in all departments ample. Fruit and vegetables were abundant for the season. The exhibition of Hon. Jas. A. Bill, of Lyme, of his fine Devon cattle, oxen, sheep, and horses would have been a good exhibition of itself. There are many other enterprising members like him. For this society we augur a permanent success. We would especially commend ts arrangement for the exhibition of dairy products.

The Watertown Fair was also visited by me, Sept. 29–30. This is one of the pleasantest agricultural towns in the State, and it has one of the best hotels. The President, O. B. King, as the manager of a fair has no superior in the State. He is perfectly enthusiastic in getting on to the park all the best cattle to be found accessible. It would richly pay any stranger to go there and see the beautiful working oxen. This show can hardly be excelled in New England. Mr. King, in connection with several other intelligent gentlemen, has revived and sustained an especial interest in his own county, one of the first and best homes of Devon cattle. He here has drawn and bred from the most celebrated herds in Connecticut; he has recently purchased some of William Mattoon's best cows. His cattle, on exhibition at this fair, will be exhibited at Philadelphia, at the World's Fair, this fall.

I had the pleasure of visiting the Norwalk Fair. This is always an interesting occasion. The exhibition surpasses almost any other in the State. The attendance is surprising. The railroad conveniences are a great advantage; liberal in granting facilities. The show in the building is superior to any in the State. The very best men are enlisted in the enterprise, and it is in every respect a success. But I should say that while they have a good show of neat stock, they do not in this respect surpass others. The show of horses was good, and the whole was conducted with propriety. Several distinguished gentlemen addressed the society on practical advancement in agriculture.

October 13th, I visited the Guilford Fair. The day was good. Found the President, Mr. W. W. Fowler, at his post, well preserved after passing through so many narrow escapes; fired up with all the zeal in agricultural advancement that the age demands,—the right man in the right place. His show of fat Devon cows was remarkable. The hall was jammed full of fruits, vegetables, etc., the ladies doing their full share. The show of trains of working oxen was remarkable. The show of fowls was extremely good. One of the most noticeable of features was the Rev. Mr. Murray's horse stock. The intellectual feast was his address.

E. H. HYDE, *Delegate.*

OFFICIAL LIST OF AGRICULTURAL SOCIETIES IN CONNECTICUT, 1875–6.

NAME OF SOCIETY.	PRESIDENT.	SECRETARY.	TREASURER.
Connecticut State,........	E. H. Hyde, Stafford.	S. M. Wells, Wethersfield,	F. A. Brown.
Hartford County,........	L. S. Wells, New Britain.	Warren Rowley, Hartford.	Wm. H. Gross.
New Haven County,.......	J. J. Webb, New Haven.	H. B. Mix, New Haven.	C. B. Whittlesey.
New London County,.....	John Turner, Norwich.	Lucius Brown, Norwich.	H. H. Gallup.
Fairfield County,..........	John P. Beatty, Norwalk.	William D. Gregory, Norwalk.	Andrew Selleck.
Windham County,.........	Arnold B. Fenner, Brooklyn.	Willard Day, Brooklyn.	A. Wylie.
Litchfield County,.......	Harry Sedgwick, North Cornwall.	D. C. Kilbourn, Litchfield.	E. C. Jones.
Middlesex County,.......	Charles Hubbard, Middlefield.	G. M. Wilson, Middletown.	G. M. Wilson.
Tolland County,..........	Wm. H. Yeomans, Columbia.	George H. Kingsbury, Rockville.	E. S. Henry.
Danbury,...............	John F. Beard, Danbury.	B. E. Cowperthwait, Danbury.	John W. Bacon.
Bloomfield,........	Louis J. Filley, Bloomfield.	H. W. Rowley, Bloomfield.	H. W. Rowley.
Union, (Falls Village,)....	C. E. Baldwin, West Cornwall.	C. B. Maltbie, Falls Village.	Wm. J. Canfield.
Ridgefield,...............	Edward H. Smith, Ridgefield.	D. Smith Sholes, Ridgefield.	Ira S. Keeler.
Guilford,.................	William E. Weed, Guilford.	Seymour Benton, Guilford.	George B. Spencer.
Oxford,..	Joel White, Oxford.	R. S. Hinman, Birmingham.	Charles H. Butler.
Milford and Orange,......	Henry C. Miles, Milford.	Edward G. Miles, Milford.	David Miles.
Torrington,..............	Hermon Cooke, Wolcottville.	Henry Bolton, Wolcottville.	Henry Bolton.
Union,*...............	Asaph McKinney, Somerville.	H. W. Allen, Warehouse Point.	Sandford M. Billings.
Meriden,................	Charles Parker, Meriden.	Levi E. Coe, Meriden.	S. H. W. Yale.
Woodbridge and Bethany,.	J. W. Bradley, Bethany.	S. G. Davidson, Bethany.	S. G. Davidson.
Woodstock,..............	Charles H. May, Woodstock.	Henry T. Child, Woodstock.	Oliver H. Perry.

* Somers, Ellington, Enfield and East Windsor.

RETURNS OF AGRICULTURAL SOCIETIES 1875—FINANCES.

SOCIETY.	Amount received from State.	Membership and Fees.	Donations.	All other sources.	Receipts for the year.	Premiums offered.	Premiums and Gratuities awarded.	Premiums and Gratuities paid.	Current expenses for the year not including premiums and gratuities.	Disbursements for the year.	Indebtedness.	Value of real estate.	Value of personal property.
Hartford County,	No fair.												
New Haven County,	No fair.												
New London County,	$300.00	$3,187.84	$201.50	$750.96	$4,440.30	$3,000.00	$1,921.50	$1,701.01	$1,930.30	$4,295.81	$5,000.00	$8,000.00	$250.00
Fairfield County,	200.00	3,411.00		1,332.28	4,943.28	1,807.50	897.00	897.00	2,000.00	2,897.00	11,160.00	22,500.00	500.00
Windham County,	200.00	2,248.17		165.00	2,613.17	1,418.30			1,479.54	2,897.84	961.34*	4,500.00	
Litchfield County,	No pre'm.												
Middlesex County,	No fair.												
Tolland County,	200.00	447.30	58.50		1,898.83	787.50		787.50	712.78	1,367.53	1,000.00	3,000.00	200.00
Danbury,	100.00	5,434.17		143.00	5,677.17	2,643.00	2,231.30	2,196.50	1,579.22	3,775.72	.00	11,000.00	2,011.18
Bloomfield,	100.00	100.00			200.00	192.00		178.00	27.00	200.00			
Union, (Falls Village)	100.00	920.90		708.59	1,729.49	2,141.75	1,747.25		232.24	1,979.49	250.00		1,750.00
Ridgefield,	100.00	1,100.00		833.47	2,033.47	1,150.00	754.00	750.00	805.50	1,555.50	.00	7,000.00	200.00
Guilford,	100.00	85.50	50.00	308.50	544.00			237.25	256 30	493.55			178.00
Oxford,	100.00	158.56		10.00	368.56	289.00	279.00	266.25	93.21	359.96			88.73
Milford and Orange,	100.00	127.00		748.77	975.75	638.00	361.25	224.50	618.37	842.87			200.00
Torrington,		284.50			541.49	599.00			292.63				50.00
Union (Somers,)	100.00	73.00			173.00	131.00		131.00	25.00	158.00			600.00
Meriden,	200.00	3,056.08		150.00	3,406.08	2,004.00	1,738.00	1,738.00	725.39	2,463.39			1,800.00
Watertown,	100.00	1,936.32		316.83	2,353.15	1,800.00	1,650.00	1,650.00	576.63	2,226.63			478.00
Woodstock,	100.00	1,125.60		490.35	3,030.35	751.50	584.82	567.00	192.47	2,148.46	1,270.00	4,700.00	
Woodb'ge & Betha'y	100.00	359.65		105.25	564.90								

*About $2,000 expended for barn and sheds on the grounds this year.

NUMBER OF ANIMALS EXHIBITED.

SOCIETIES.	Bulls.	Milch cows.	Heifers.	Calves.	Working oxen.	Steers.	Fat cattle	Horses.	Sheep.	Swine.	Poultry.	Other stock.
Hartford County,	No fair.											
New Haven County,	No fair.											
New London County,	16	38	65	88	50	40	18	41*	147	70	180	48
Fairfield County,	10	16	15	18	24	2		37	30	13		
Windham County,	24	24	25	20	138	8	2	50	72	20		
Litchfield County,	No pre'm											
Middlesex County,	No fair.											
Tolland County,	5	10	4	6	40	8	2	80	7	4	50	
Danbury,	19	58	18	29	230	14	10	88	96	24	64‡	17
Bloomfield,												
Union (Falls Village),	15	21	28	4	6	17	8	35	84	8	47	2
Guilford,	6	14	4	4	160	10	2	26		31		14
Oxford,	3	10	10	4	40		4		44	11	2‡	
Milford and Orange,	5	12	7	8	12	16	4	29	15	18	49	
Ridgefield,	5	4	15	4	36	7	2	61	80	12	50	20
Meriden,	7	85	28		34	14	4	88			28	
Watertown,	84	37	44	88	376	84	14	67	75	10	100‡	100
Woodbridge and Bethany,	6	27†			34	22	8	44	8	1	30	
Woodstock,	18	51	22	8	56	22	5	98	22	20	16‡	

*Not including "Fast horses." †Including heifers. ‡Coops.

ANALYSIS OF PREMIUMS AND GRATUITIES AWARDED.

FARM STOCK.

SOCIETIES.	Bulls.	Milch Cows.	Heifers.	Calves.	Working oxen.	Steers.	Fat cattle.	Horses.	Sheep.	Swine.	Pou'try.	All other stock.	Total amount offered for live stock.	Total amount awarded for live stock.	Total amount paid for live stock.
Hartford County,	No fair.														
New Haven County,	No fair.														
New London County,	$68.50	$174.00	$98.75	$37.50	$83.50	$39.50	$12.00	‡$163.00	$66.00	$37.00	$26.50	†$500.00	$2,587.25	$1,306.50	$1,275.49
Fairfield County,	42.00	40.00	45.00	16.00	39.00	4.00		160.00	42.00	24.00	38.50	15.00		465.50	
Windham County,	69.00	48.00	46.00	20.00	138.00	32.00	6.00	621.00	43.00	23.00	21.00				1,067.00
Litchfield County,	no prem														
Middlesex County,	No fair.														
Tolland County,	15.00												540.00	540.00	540.00
Danbury,	53.50	117.00	41.00	24.00	153.00	19.00	24.00	1,016.00	52.00	36.00	37.00	14.00	1,815.00	1,586.50	1,586.50
Bloomfield,															150.00
Union (Falls Village,)	46.00	59.00	56.00	8.00	32.00	52.00	8.00	101.00	32.00	9.00	22.00		733.00	433.00	433.00
Guilford,	5.50	6.00	2.00	1.00	26.00	6.00	1.50	20.00		6.00	24.50	3.50		102.00	102.00
Oxford,	8.00	17.00	‡6.50	2.00	49.00	4,50	4.00	31.50	20.00	1.00	2 00		191.00	145.50	145.50
Milford and Orange,	13.00	24.00	12 00	1.50	12.00	12.00	5.00	122.00	9.00	18.00	13.00		450.50	247.50	149.00
Ridgefield,	18.00	14.00	29.00	5.00	55.00	25.00	8.00	337.00	21.00	6.00	13.50	10.00	724.00	541.50	541.50
Torrington,	19.00	‖		53.00	14.00	40.00		16.00		7.00	17.00	268.75	434.75		
Union, Somers, &c.,															53.00
Meriden,	25.00	27.00	30.00		46.00	12.00	6.00	1,230.00		15.00	30.00	*60.00	1,719.00	1,421.00	1,421.00
Watertown,	99.00	120.00	87.00	18.00	355.00	52.00	13.00	282.00	60.00	16.00	175.00		1,757.00	1,508.00	1,381.00
Woodbridge and Bethany,	12.50	18.25§			12.00	6.00	14.00	31.00	12.00	2.00	25.00				
Woodstock,	22.00	50.00			50.00		11.00	180.00	14.00	12.00	14.00		430.00	380.00	375.00

*String teams. †Fast horses. ‡Not including fast horses. §Including heifers. ‖Cows, heifers and calves. ¶Sheep and Swine.

ANALYSIS OF PREMIUMS AND GRATUITIES—CONTINUED.

FARM PRODUCTS.

SOCIETIES.	Indian corn.	Wheat.	Rye.	Oats.	Beans.	Grass seed and barley.	Potatoes.	Carrots.	Beets.	Parsnips.	Turnips.	Onions.	Other root crops
Hartford County,	No fair.												
New Haven County,	No fair.												
New London County,	$1.75		$1.00	$1.50	$3.50		$13.50	$ 50	$1.75	$ 50		$2.00	$11.25
Fairfield County,	3.50	$3.50	2.50	2 50		$2.00	11.50	1.50	1.50	1.00	$1.00	4.50	29.00
Windham County,													
Litchfield County,	No pre'm												
Middlesex County,	No fair.												
Tolland County,	5.00		1.00	50			7.00	50	50			1.00	
Danbury,	7.25	5.00	10.50	10.50	1.75		20.50	75	75		1.00	4.50	13.50
Bloomfield,													
Union (Falls Village,)	29.50		19.50	8.50	1.00	2.00	5.00	3.00	3.00		3.50	1.00	
Guilford,	6.75		75	75	7.50		8.50	1.25	3.00	75	2.75	2.75	12.50
Oxford,	5.75		1.00	1.00	75		8.00	50	1.50	1.00	2.00	75	
Milford and Orange,	14.50		1.50	1.50	1.00	1.00b	9.00	1.25	3.00	50	3.00	2.75	11.00
Ridgefield,	2.25	4.50	2.50	4.50		2.50	14.75		75		25	6.75	7.75
Meriden,	3.50	1.50	1.50	2.00		1.50b	8.00	1.00	2.00	1.00	3.00	1.50	16.00
Watertown,	1.50	1.50	1.50	1.50	1.50	1.50	5.00	1.50	1.50		1.50	1.50	
Woodbridge and Beth'y	12.25		1.25	1.25	2.75	1.25b	17.00	1.50	6.50		9.50		
Woodstock,	2.25		2.25	2.50		2.25b	9.00		4.00		3.50	4.00	

ANALYSIS OF PREMIUMS AND GRATUITIES—CONTINUED.

FARM PRODUCTS.

SOCIETIES.	Total amount offered for Grain and Root Crops.	Total amount awarded for Grain and Root Crops.	Total amount paid for Grain and Root Crops.	Plowing at Exhibition.	Fruits.	Flowers.	Butter.	Cheese.	Honey, maple sugar, and preserved fruits.	Bread and cake.	Total amount paid for farm products.	Amount awarded for farm implements.	Mechanical inventions, domestic manufactures, &c.	No. of persons who received gratuities and premiums.	No. of Diplomas.
Hartford County,	No Fair.														
New Haven County,	No Fair.														
New London County,	64.00	37.25	37.25	15.00	26.00	11.75	16.00	10.00	9.00	8.00	245.00	21.00	258.75	220	
Fairfield County,		68.50			101.50	70.00	2.00		14.00	7.50		14.50	89.75		26
Windham County,		36.00			78.25	46.00	19.00	14.00	10.50	10.00	218.75	17.00	137.55	225	
Litchfield County,	No Pre.														
Middlesex,	No Fair.														
Tolland,					20.00	3.00	8.00	2.00	1.00						
Danbury,	189.00	76.00	76.00		68.75	62.50	3.00	3.00	15.00	21.75	250.00	20.50	339.50	352	8
Bloomfield,															
Union, (Falls Village),	136.50	104.00	104.00		23.00	38.75	12.00	9.00	8.00	2.00		1.00		173	
Guilford,		47.25	47.25		39.75	1.75	.75	.50	8.75	1.75	113.00		22.25	140	
Oxford,	14.50	22.25	22.50		27.50	5.50	8.00	2.00	.50	4.00	71.00		5.50	55	
Milford and Orange,	72.15	52.25	38.50		20.50	5.00	3.00		3.50	6.00	72.25		12.75	84	12
Ridgefield,	106.00	46.75	46.75		14.50	45.50	1.50		9.50	10.75	131.75	8.50	85.25	168	7
Torrington,	20.75	15.25			†16.00		††4.50						38.00	260	
Union, (Somers, etc.,),		13.00													
Meriden,	44.00	42.50	42.50		32.00	13.00	15.00		4.00	4.00	110.50		90.00	109	
Watertown,	4.300	34.00	34.00	*75.00	58.00	24.50	20.00	6.00	7.00	3.00	163.00	11.50	46.00	140	
Woodbridge and Bethany,					67.50	17.25	3.00		3.50	3.75					
Woodstock,	30.25	29.75	29.75	40.00	29.75	26.25	6.00		16.50	1.00	169.25				

*Management of Farms. †And Flowers. ††And Cheese.

NAMES OF TOWNS AND CITIES TO WHICH THE PREMIUMS AND GRATUITIES WERE DISBURSED, AND THE AMOUNT TO EACH.

FAIRFIELD COUNTY SOCIETY.

Bethel,	$20.00
Greenwich,	11.00
Bridgeport,	21.00
Ridgefield,	15.00
Darien,	56.00
Fairfield,	51.00
Westport,	145.00
Wilton,	38.50
Norwalk,	278.25
New Canaan,	102.75
Stamford,	56.00
Huntington,	15.00
Milford,	33.00
Stratford,	33.00
Easton,	4.00
Danbury,	7.00

MERIDEN SOCIETY.

Middletown,	38.00
Middlefield,	47.00
Berlin,	53.00
Cheshire,	17.00
Vernon,	125.00
Haddam,	10.00
Portland,	7.00
Waterbury,	30.00
Wethersfield,	2.00
Southington,	7.00
Plainville,	41.00
Cromwell,	27.00
Hartford,	244.00
New Haven,	229.00
Wallingford,	43.00
Westfield, Mass.,	150.00
New York,	50.00
Meriden,	618.00

RIDGEFIELD SOCIETY.

Southport,	$18.00
Darien,	10.00
Katonah, N. Y.,	5.00
Weston,	3.00
Brewster's Station, N. Y.,	4.00
Ridgefield,	326.00
So. Salem, N. Y.,	49.00
No. Salem, N. Y.,	4.00
Reading,	28.00
Wilton,	25.50
Norwalk,	75.25
So. Norwalk,	12.25
New Canaan,	12.00
Stamford,	132.00
Pound Ridge, N. Y.,	1.00
Bethel,	17.00
Danbury,	18.00
Brookfield,	13.50

OXFORD SOCIETY.

Oxford,	
Watertown,	
Seymour,	
Derby,	
Huntington,	
Southbury,	
Naugatuck,	
Monroe,	

MILFORD AND ORANGE SOCIETY.

Milford,	$230.70
Orange,	34.60
New Haven,	40.00
Derby,	25.00
Stratford,	10.75

GUILFORD SOCIETY.

Guilford,	$208.50
Clinton,	15.50
Branford,	4.50
North Branford,	3.25
New Haven,	2.50
Madison,	3.00

OFFICIAL LIST OF FARMERS' CLUBS IN CONNECTICUT, 1875–6.

NAME OF CLUB.	PRESIDENT.	SECRETARY.
Columbia, - - -	S. F. West,	W. H. Yeomans.
East Granby, - -	Carlos Bates,	B. E. Smith.
East Windsor, - -	Israel H. Stiles,	John F. Fitts.
Jewett City, - -	Thomas A. Clark,	H. L. Reade.
Lebanon, - - -	W. C. Noyes,	O. E. Pettis.
Meriden, - - -	Oliver Rice,	L. E. Coe.
Middlefield, - -	M. W. Terrill,	P. M. Augur.
Morris, - - -	A. C. Tracy,	S. W. S. Skilton.
Mystic, - - -	Jeduthun Whipple,	L. W. Crouch.
New Canaan, - -	Edwin Hoyt,	Joseph F. Silliman.
Newington, - -	Joshua Belden,	John S. Kirkham.
North Stonington, -	Thomas W. Wheeler,	F. S. Peabody.
New Britain, - -	L. S. Wells,	Elihu Burritt.
West Cornwall, - -	E. D. Pratt,	T. S. Gold.
Westfield, p. o. E. Berlin,	L. Doolittle,	M. W. Wilcox.
Westport, - - -	F. J. Taylor,	S. B. Sherwood.
Woodstock, - -	George Child,	Dr. G. A. Bowen.

CONNECTICUT AGRICULTURAL EXPERIMENT STATION.

PRELIMINARY REPORT.

The Committee of the Trustees of Wesleyan University, to whom has been entrusted the organization of a "work appropriate to an Agricultural Experiment Station," contemplated in the legislative appropriation for that purpose, take pleasure in presenting the following report of the Director.

That the portion thus far expended of the installments which have accrued has been economically and profitably employed will, they trust, appear from the fact that, while considerable other and no less useful labor has been performed, analyses of fertilizers have been made during the first half year which, at the prices charged by leading chemists, would alone have cost more than the appropriation from the State for an entire year.

The Committee are happy to bear testimony to the skill, faithfulness and zeal with which the chemists of the Station have performed its work.

ORANGE JUDD,
A. B. CALEF, } *Committee.*
C. D. FOSS,

PRELIMINARY REPORT.

To attempt any report of the work of the Experiment Station, when but little more than half a year has elapsed since its first organization, would be some like giving an account of the operations of a farm before a single summer had passed since the clearing of the land. The plan of operations and the incipient stages of the work might be explained sufficiently for comment and criticism, but the prospect of success or failure would be more certain when a season's crops had been harvested.

In the following brief preliminary report are described some of the main features of the organization and first labors of the Station.

The bill making an appropriation of $2,800 per annum to Wesleyan University "to be used in employing competent scientific men to carry on the appropriate work of an Agricultural Experiment Station," was approved July 20, 1875, during the summer vacation at the College.

Prompt efforts were made by the trustees of the University to secure the services of proper men for the work. Early in October, very shortly after the opening of the fall term, a chemist was on the ground, and as soon as practicable two assistants were secured. Arrangements were also made by which the professor of chemistry in the College was relieved of a part of his regular labor of instruction and enabled to assume charge of the work as Director.

Feeling that this enterprise should be entirely for the benefit of the farmers of the State, and that their counsel, sympathy, and coöperation were indispensable to its success, the Committee of the Trustees of the University to whom the organization of the Station had been referred, invited the

State Board of Agriculture and the Farmers' Experiment Station Committee to meet at the college, October 12, 1875, and advise concerning plans for carrying out the purpose of the appropriation.

Both the Board and the Committee evinced their interest in the matter by a full attendance at the meeting. From the gentlemen present an Advisory Committee was appointed, whose number was afterwards enlarged so as to include prominent and progressive farmers from all the counties of the State. The writer feels that whatever measure of success may attend the labors of the Station will be largely due to the wise and liberal counsels, earnest sympathy and active support of the Advisory Committee.

It has been felt from the first that more abstract scientific investigations would afford not only the proper, but also the most widely and permanently useful field of labor. But the need of a fertilizer control system was so pressing and so vital to the interests of a considerable portion of the farmers of the State that it seemed absolutely necessary to turn the first efforts in this direction. Accordingly analyses of fertilizers sold in the State were undertaken, and circulars giving directions for the selection and forwarding of samples were widely distributed. Some of the further efforts made to introduce into this State a system of trade in commercial fertilizers by which the same shall be "bought and sold upon the basis of their commercial value as shown by their composition," are given herewith.

The following is a copy of a circular which was sent to a large number of persons interested, and published in the press of the State:

WETHERSFIELD, CONN., Dec. 28, 1875.

Dear Sir:

"It is plainly for the interest of both dealer and consumer that fertilizers should be bought and sold upon the basis of their actual value as determined by their composition. To further such a regulation of the trade in commercial fertilizers, arrangements will be made with those dealers who wish to place their stock under the supervision of the Agricultural Experiment Station, whereby their wares will be inspected, samples taken for analysis, and results of same reported under authority of the director."

As harmony of action is necessary to insure confidence, you are requested to be present at a meeting of Farmers and Dealers, to be held at Orange Judd Hal

Middletown, Conn., at 11 o'clock, A. M., Thursday, Jan. 13th, 1876, to devise and accept means by which these desirable results may be attained.

S. M. WELLS, Chairman,
Of Advisory Committee, Connecticut Agricultural Experiment Station.

The success of this meeting was greater than any but the most sanguine had hoped. Not only were over seventy farmers, representative men from all parts of the State, present, but a large number of leading manufacturers and merchants connected with the fertilizer trade in this and other States, showed their interest in the matter by attending themselves, or sending special representatives to the meeting. Among the latter, were parties from Boston, New York, Baltimore and intervening places. A report says:

> "Many of the merchants here represent other large concerns, so that it may be affirmed that the fertilizers trade generally gives this Experiment Station its entire and cordial support. And I may add that farmers are more than satisfied with the action of this meeting. The good feeling manifested here between all parties in the warmest terms is worth coming to Middletown to see."

"The following resolutions, drafted by a joint committee of dealers and farmers, were adopted after full deliberation and with entire harmony. They were emphasized by the gentlemen present, without a dissenting voice, and in a manner that promises their fulfillment":

WHEREAS, An Agricultural Experiment Station has been established at Middletown for the promotion of the interest of the agriculture of the State; in order to avail ourselves of the benefits of said institution, be it

Resolved, That all fertilizers sold in the State should be sold under a guarantee of their composition, to be determined by analysis at the Station.

Resolved, That we recommend to all manufacturers and dealers to place their stocks under the supervision of the Station, subject to their examination at all times.

Resolved, That as consumers of fertilizers we will give the preference in our purchases to those dealers who offer their goods under this guarantee.

At the close of the meeting, in a conference of the manufacturers and dealers present with the Director of the Station, the outlines and general tenor of an agreement between the Station and the sellers of fertilizers were decided upon. It was then proposed that, as soon as the details could be arranged by needed and proper consultation, a form of agreement should be drawn up and presented to the sellers of fertilizers in this State for approval and signature.

After due consultation with the advisory committee on the one hand, and with leading sellers and consumers of fertilizers on the other, a form of agreement was drawn up and forwarded to dealers. Further details of the carrying out of this and other parts of the general plan for the establishment of a fertilizer control system, may be found in subsequent pages.

A report on the fertilizers sold in the state would, at this time, be premature. We are still in the midst of the fertilizer season, samples are continually coming in from dealers and consumers, and a good many are yet to be collected. As soon as the investigation of the articles thus received from various sources shall be completed, we hope to be able to make quite a full report of the condition of the fertilizer market in the state. Meanwhile we offer the following "Circular No. 4" as a partial account of analyses made up to the present time.

In the first edition, which was published by the Station, the following note was appended.

Every effort has been made to communicate the results of the work of the Station to the farmers of the state. To this end accounts of its organization and labors have been furnished to the press, circulars have been issued and farmers' meetings held at the Station. It is hoped that this pamphlet which, in lack of public appropriation, is printed at private expense, may be found useful in explaining one of the many ways in which science may be made useful to agriculture.

That edition, 2,000 copies, having been exhausted, and the call for them still continuing, the circular is herewith offered for re-publication. Some changes, suggested by further experience and by questions from parties interested, are made in this second edition.

The analysis of fertilizers is by no means the most important work of an Agricultural Experiment Station. Such an institution will be worthy of the name in proportion as it carries on accurate and thorough investigations and experiments in agricultural science. The knowledge thus gained of the principles that underlie the right practice of agriculture, has a very much wider and more permanent value than exposure of frauds or regulation of the trade in fertilizers. This is simply in accordance with the fact that the knowledge of any principle is of more consequence than any one special application of it. It is important for the farmers of Connecticut to know whether they get the worth of their money in the manures they buy, but is of equal consequence that they should know how to use them. And it is of still more importance to them to learn how they shall manage their fertilizers, their crops, their fodder materials, and their stock, so as most economically and profitably utilize the products and the productive power of their farms. That these facts are appreciated by our best farmers is very gratifying. That such knowledge is becoming increasingly valued for its own sake is still more so.

During the last summer some experiments were undertaken with the hope of making new contributions to our knowledge of the development of sundry of our common farm plants, and throwing some light on the question of rotation of crops and the feeding values of the products. Specimens of grass, clover and cereal crops, grown on different soils, and with different methods of manuring and culture, were cut at different periods of growth, from plots of known size, weighed and portions reserved for analysis. Samples of the roots and of the soils in which they grew were also gathered. Over forty specimens of roots and tops, and several of soils were thus collected. It was hoped that opportunity would be found during the winter for proper investigations in the laboratory of these products of the fields, but the various details of labor incident to getting the work of the Station systematized and, more especially, the analyses of fertilizers, have demanded so much attention that little time has yet been found to prosecute these investigations.

But few persons have any adequate conception of the amount of labor needed for accurate scientific researches. In the experiments above mentioned, the separation of a single lot of roots from the soil, required, in each of a number of cases, the painstaking labor of a whole week.

A number of specimens of muck and of natural manures of various sorts have been received, and investigations upon them begun. So soon as the stress of work upon artificial fertilizers is over, these and studies other will be continued.

Large numbers of letters of inquiry have come to the Station. These have been replied to, as fully as the time and opportunity of the laborers would permit. We ask those who may feel that their communications have not received as ready and full answers as their importance would demand, to remember that many of their inquiries can not be answered without previous study and experiment, and that even were the knowledge at hand, the putting of it in satisfactory form in individual letters consumes a great deal of time that is needed for other work. Still these inquiries are always welcome, and will be answered as well as is in our power.

The cordial sympathy which has been manifested on all sides in behalf of this enterprise has been very encouraging. Thanks are especially due to a number of persons for valuable assistance in various ways.

A very essential addition to the means for the prosecution of experiments has been afforded by the liberal offer, on the part of its proprietor, Dr. J. W. Alsop, Jr., of Middletown, of free use of lands and appliances of Arawana farm. The accuracy with which this farm has been surveyed, its thorough drainage and complete equipment, its systematic management and its ready accessibility to the Station give it an unusual fitness for purposes of experiment.

W. O. Atwater, Director.
Orange Judd Hall, Wesleyan University.

Middletown, Conn., May 1, 1876.

COMMERCIAL FERTILIZERS.

CONNECTICUT

Agricultural Experiment Station.

Circular No. 4.

2D EDITION.

ADVISORY COMMITTEE.

S. M. WELLS, Wethersfield, Chairman,
J. M. HUBBARD, Middletown, Sec'y,
T. S. GOLD, West Cornwall,
J. J. WEBB, Hamden,
J. B. OLCOTT, South Manchester,
H. LARRABEE, Gale's Ferry,
T. B. WAKEMAN, Green's Farms,
W. H. YEOMANS, Columbia,
GEO. AUSTIN BOWEN, Woodstock.

W. O. ATWATER, DIRECTOR.

CHEMICAL LABORATORY, ORANGE JUDD HALL,
WESLEYAN UNIVERSITY:
MIDDLETOWN, CONN.

CHEMISTS.

W. O. ATWATER, Ph. D., Director,
W. C. TILDEN, M. D.,
W. BALENTINE, B. S., Assistant,
R. B. GRIFFIN, Assistant.

TO THE FARMERS OF CONNECTICUT.

We call your attention to the following circular on Commercial Fertilizers from the Connecticut Agricultural Experiment Station. This includes explanations of the composition and uses of Commercial Fertilizers, of the methods of judging of their value from analysis, and of the means adopted by the Station to introduce a Fertilizer Control System in this State.

The State law requires packages of commercial fertilizers sold or offered for sale in the State, to be accompanied by an analysis, giving the percentages of valuable ingredients. The Station supplements this by securing from dealers an agreement to guarantee the correctness of the analyses by which they sell, and tests the reliability of the latter by inspecting wares offered for sale. Still further it provides that farmers may have the fertilizers they buy analyzed at small cost or for nothing.

We earnestly advise all buyers of these fertilizers in the State to purchase of those dealers, and those only who place their wares under the supervision of the Station, and to select those articles which furnish the valuable fertilizing ingredients in the best form, and at the lowest price per pound. Ample means for protection against fraud and the securing of good fertilizers at fair prices, are thus offered to us by the Station.

In the furtherance of this as of the other departments of the work of our State Agricultural Experiment Station, we invite your most hearty sympathy and co-operation.

S. M. WELLS,	J. B. OLCOTT,
J. M. HUBBARD,	H. LARRABEE,
T. S. GOLD,	T. B. WAKEMAN,
J. J. WEBB,	W. H. YEOMANS,

GEO. AUSTIN BOWEN,
Advisory Committee,
Connecticut Agricultural Experiment Station.

COMMERCIAL FERTILIZERS.

The brief experience of the Station has shown that elementary explanations of scientific facts, are necessary to make its work most useful to the largest number of those whom it is intended to benefit.*

When a miner wishes to know whether it is safe to invest his money in a mine, he has the ore analyzed to determine how much of precious metals it contains. What he wishes is not earth nor quartz, for these are plenty and have no commercial value. He wants rather the gold and silver which are scarce and valuable.

Guanos, phosphates and other fertilizers are mixtures of various materials. Some of these materials are abundant in every soil, others, though indispensable to the growth of every crop, are often lacking. These latter are valuable because of their necessity to crops and their scarcity in the soil, and are to artificial fertilizers what gold and silver are to their ores.

In buying fertilizers the object should be to get those which furnish the materials which the land and crops need, in the best form and at the lowest cost. How much Connecticut farmers need more definite knowledge of the composition and uses of fertilizers, is illustrated by some of the facts brought out by such work as is being done at the Station.

Nitrogen is one of the most important and necessary ingredients of commercial fertilizers. At the prices at which the farmers of the State have been buying these articles, they have been paying often as high as 40 or 50 cents, or more, a pound for nitrogen, and this in what, from their continued sale may, be called standard articles. And yet they can obtain nitrogen in the very best forms at from 20 to 25 cents per pound and less, and there is no reason why they need pay more than this if they only know how to make their selections. But while they are without just this information, foreign manufacturers who have it, are coming into our markets, taking the materials which furnish nitrogen more cheaply, carrying them away for European farmers to use, and leaving the poorer and costlier sources of supply for our farmers to draw from. Fish and slaughter house products, in which any farmer in Connecticut can have nitrogen at from 20 to 25 cents per pound, are thus in demand for foreign exportation, while large quantities of low grade fertilizers, many of which contain these same materials mixed with others of inferior value, are sold to our farmers at prices which bring the nitrogen at 30, 40, and 50 cents, and still higher, per pound.

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* For those who are not fresh or well-versed in chemistry, this circular may not be easy reading. It is a somewhat difficult task to translate the results of scientific work from the technical phraseology of the laboratory into the more familiar language of daily life. The subject is, however of the greatest importance, and its study will not only be of great aid in judging of the value of fertilizers, but will also help those who may be interested, to understand more fully the circulars which will be hereafter issued by the Experiment Station.

Potash is another of the valuable ingredients of manures. Potassic fertilizers can be had by any farmer in Connecticut at such prices and of such quality as to make the cost of the potash from 6 to 8 cents per lb. At the same time they are sold so as to bring the potash up to 10, 15, and in some cases over 30 cents per lb.

With phosphoric acid the case is similar. In many low grade phosphates it costs the buyer twice or more than twice as much as he would pay for it in the higher grade wares.

And what is worse than all this, positive frauds are continually practiced by unscrupulous sellers who palm off inferior or worthless stuffs upon our farmers as pure and high grade fertilizers. And it is often impossible, from their appearance alone, to tell the good from the bad.

And finally the best artificial fertilizers often fail because they are not properly applied.

The reason of these facts is simple. Our farmers do not know, and they have only too little means of learning what fertilizers to select, and when, and where, and how to use them.

WHAT IS THE USE OF COMMERCIAL FERTILIZERS?—PLANT FOOD.

Plants, like animals, require food for life and growth. A part of the food of plants is supplied from the atmosphere, the remainder is derived from the soil. No ordinary cultivated plant can thrive without a sufficient supply of each of a number of substances needed for its food. With an abundance of all of these, in forms in which the plant can use them, and with other circumstances favorable, the plant will flourish and the yield be large. But if the available supply of any one of them be too small, a light yield is inevitable. For instance, *potash* is an *essential ingredient* of the food of plants. If all the other conditions for a profitable crop of corn or potatoes, or other plants are fulfilled in the soil, except that potash is deficient, the crop will inevitably fail. But if the potash be supplied, the yield will be abundant. The chief use of fertilizers is to supply the plant-food which the soil lacks.

A SHORT LESSON IN CHEMISTRY.

TO BE CAREFULLY STUDIED.

Vegetable and animal substances, and manures and soils as well, contain, besides WATER, two kinds of materials, the so-called "ORGANIC MATTER" and the MINERAL MATTER" or ASH. By keeping a wisp of hay or a bone for a time in a hot oven, the water may be driven out. If the dried material be put in the fire the organic substance will be burned away and escape as gas or smoke, while the mineral matter will be left as ashes.

THE ORGANIC MATTER consists chiefly of the four chemical elements CARBON, OXYGEN, HYDROGEN, and NITROGEN. We are familiar with Carbon in charcoal and lamp-black, which are nearly, and in diamond which is quite pure Carbon. Hydrogen and Oxygen united form water. We do not need to trouble ourselves about these in fertilizers because they are supplied to the plant in abundance by the atmosphere and the soil, through the leaves and through the roots. But the

NITROGEN

is an important ingredient of fertilizers. It is, in its pure state, a gas, and makes up about four-fifths of the air. Combined with hydrogen it forms AMMONIA; combined with oxygen it is known as NITRIC ACID. In these and other combinations it occurs in minute quantities in the atmosphere, and in considerable quantities in soils and manures. Plants are unable to make use of the pure nitrogen of the air, though some, if not all, absorb a very little combined nitrogen from the atmosphere. By far the largest part of the nitrogen of plants is absorbed from the soil through the roots. From the facts that nitrogen is available to plants only in certain combinations, that it is slow to form and easily leaves these compounds, that it readily escapes from manures and soils into the air and is leached away by water, it is one of the most commonly deficient and hence the most costly ingredients of the food of plants.

THE MINERAL MATTER OR ASH

of plants is derived entirely from the soil. It consists of several ingredients, known as Potash, Soda, Lime, Magnesia, Iron, Silica, Sulphuric Acid, Phosphoric Acid, and Chlorine. Of these, POTASH is dissolved and leached out of ashes by water, and is the chief ingredient of the lye thus produced. LIME is well known to us, though not in a chemically pure form, in ordinary quick-lime. SULPHURIC ACID is familiarly known in the form of oil of vitriol. Combined with lime it forms SULPHATE OF LIME or Plaster.

PHOSPHORIC ACID SOLUBLE AND INSOLUBLE. PHOSPHATES AND SUPER-PHOSPHATES.

Lime combined with Phosphoric Acid forms Phosphate of Lime, which is the chief constituent of the mineral matter of bones and of the South Carolina, Navassa, and other mineral Phosphates. There are several different compounds of Phosphoric Acid and Lime. The one which occurs in bones and mineral phosphates is called "Bone phosphate of lime." The ordinary phosphate of lime, or bone phosphate, is not easily dissolved in water, and is likewise but very slowly available to crops as food. The reason of this is simple.

The plant may be said to live, not by eating, but by drinking. That is to say, the roots absorb food from the soil not in solid particles, but after it has been dissolved. The plant food is dissolved by the water in the soil and absorbed in solution by the roots of the plant, just as the sugar dissolves in our coffee before we drink it.

In order, then, that the ordinary phosphate of lime may be available as food to the plant, it must be changed to a soluble form. This alteration goes on slowly in the soil. The same result is quickly effected in the manufacture of *Super*-phosphates, by treating the "bone phosphate" with sulphuric or other acid. In this process the sulphuric acid takes away part of the lime from the "bone-phosphate" and forms with it sulphate of lime. The compound of phosphoric acid and lime which has thus lost part of its lime is called *Super-phosphate of lime*, and is soluble in water. According as more or less sulphuric acid is used, more or less of the *Insoluble Phosphoric acid* of the "bone-phosphate" becomes the *Soluble Phosphoric acid* of the *Super-phosphate.*

The other substances which plants remove from the soil and fertilizers supply, are also found in compounds sold in every drug-store, and in constant use in our daily life. Magnesia occurs combined with sulphuric acid, as sulphate of magnesia in Epsom Salts. Glauber's Salt is a sulphate of soda. Soda is a compound of the metal sodium with oxygen, just as potassa or potash is a compound of the metal potassium with oxygen. If sodium be combined with chlorine instead of oxygen, we have chloride of sodium, which we know by the name of salt, and use to give flavor to our food, and to preserve our meat. So potassium combines with chlorine to form Chloride of potassium, which is largely used as a fertilizer under the name of Muriate of Potash. Silica occurs pure in quartz or "rock crystal," and is the chief constituent of sand and many other minerals.

When we have learned what substances the plant takes from the soil, the next question is whether these are all necessary to its growth. If it cannot flourish without an abundant supply of each one of the whole list, and if these are not resupplied by atmosphere and soil as they are removed by crops, then they must be restored in manuring or the crops will fail. But if any of them are not essential to the growth of plants we need not trouble ourselves about that one in manures.

THE ESSENTIAL INGREDIENTS OF THE FOOD OF PLANTS.

The following is a concise summary by Prof. S. W. Johnson, of the results of a vast amount of accurate and laborious experimenting on the nutrition of plants, performed for the most part in the European Experiment Stations, in order to discover what are the necessary ingredients of the food of plants.

"In regard to the food of plants, it has been settled that potash, lime, magnesia, iron, phosphoric acid, and sulphuric acid must be furnished to all agricultural plants through their roots and by the soil, in order to their growth. It has also been shown that soda, silica, and chlorine are not needful for the early growth of grain crops, but that chlorine is essential for the perfection of the seed, and that silica is probably necessary to uniform blossoming and ripening. It is further proved that water must enter crops through their roots; that carbon, which constitutes more than half their weight, is superabundantly furnished by the air; that air and water together yield the materials out of which fully ninety to ninety-eight per cent. of crops is built up; and that the soil has to give for their nourishment but the two to eight per cent. of mineral matters which remain as ashes when they are burned, and the one-half to two per cent. of nitrogen which they also contain. It is likewise definitely settled that nitrates in the soil are the chief natural source of nitrogen, while the ammonia of manures, as well as a variety of substances containing nitrogen, and found in urine or formed in the decay of dead animals, likewise supply vegetation with nitrogen."

NATURAL STRENGTH AND EXHAUSTION OF SOILS. AVAILABLE PLANT FOOD.

Crops take from the soil then, the materials needful for their growth; and these are rightly called "plant-food." Some soils yield large crops, many years in succession, without manuring. They do this because they contain large stores of the ingredients of plant-food, as potash, lime, nitrogen, etc., and because these are furnished in available forms, so that the plant can readily use them. Most of the plant-food in our soils is, so to speak, locked up in coarser or finer fragments of rocks and in partly decayed vegetable matter. In what is commonly called "weathering," these mineral and vegetable substances undergo certain chemical changes, which set free the lime and phosphoric acid and potash and other ingredients of plant-food, and change them to such forms that they may be dissolved in the water of the soil, and absorbed by the roots of the plants. There are some soils that have a very great natural strength. That is, they not only contain very large stores of plant-food, but by weathering or otherwise, new portions are made available as rapidly as the older ones are removed in cropping. The famous "black-earth" soils of Southern Russia, are of this sort, and there are lands in this country from which good crops of corn and wheat have been taken regularly for many years without manuring. But these soils are exceptions. As a rule, after cropping for some time, the point is reached where the natural re-supply of plant-food is insufficient to produce large crops. In other words, in the so-called "poor," "worn-out," or "exhausted" soils, the natural strength is insufficient for profitable production.

WHAT MATERIALS ARE LACKING IN POOR AND "WORN-OUT" SOILS?

In order to know what fertilizing materials to use on such soils, we must know what ingredients of plant-food are deficient, and what manures will best supply them. An idea of the essential ingredients of plant-food removed from the soil in cropping, may be obtained from the table below, which is copied, with slight alterations, from a lecture by Prof. S.W.

Johnson, in the report of the Connecticut Board of Agriculture for 1871. The crops are supposed to be grown upon, and removed from a given area of land, as, for instance, an acre.

TABLE 1.

Materials Removed from the Soil by Various Crops.	Sulphuric acid.	Phosphoric acid.	Lime.	Magnesia.	Potash.	Nitrogen.
TOBACCO.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Leaves, 1,800 lbs., 1,260 lbs. dry, -	14	7½	73	17	71	49
Stalks, 1,100 lbs. dry, - - -	3	15	15	2	47	33
Total, - - - - - -	17	22½	88	19	118	82
RYE.						
Grain, 32 bushels—1,800 lbs., - -	1	15	1	3½	10	32
Straw, 3,800 lbs., - - - -	3	7	12	5	29	9
Total, - - - -	4	22	13	8½	39	41
INDIAN CORN.						
Grain, 76 bushels—1,200 lbs., - -	1	23	1½	7½	14	67
Stalks and leaves, 8,000 lbs., - -	20	30½	40	21	133	38
Total, - - - - - -	21	53½	41½	28½	147	105
HAY.						
2¾ Tons, - - - - - - -	2	23	43	18½	96	73
POTATOES.						
Tubers, 300 bushels, - - -	11	32	4	7	101	58

Large quantities of Silica, and small quantities of Soda, Chlorine, and Iron are also removed from the soil by every crop. Iron is necessary to the growth of all agricultural plants, but in very minute quantity. In many cases small amounts of chlorine seem to be requisite. Silica, if needed at all, which is quite doubtful, is required only in extremely minute proportions. Soda does not appear to be an essential ingredient of plant-food. In so far as these latter are *essential* ingredients of plant-food, they are furnished in abundance by every ordinary soil.

For our present purposes, therefore, we have to consider only the *Potash*, *Lime*, *Magnesia*, *Sulphuric acid*, and *Nitrogen*. Of this list the magnesia is commonly, though not always, supplied in sufficient quantities in even "worn-out" soils. Sometimes its presence in fertilizers may be of considerable importance to crops. Sulphuric acid and Lime are more often deficient, and hence one reason of the good effect so often observed from the application of lime and plaster. The remaining substances, the *Nitrogen*, *Phosphoric Acid*, and *Potash*, are the most important ingredients of our common commercial fertilizers, because of both their scarcity in the soil and their high cost. It is in supplying these that guano, phosphates, and bone manures are chiefly useful. It should be borne in mind however, that more or less of the good effect of fertilizers is due to their *indirect* action in rendering stores of food, already present, or otherwise supplied to the soil by the atmosphere, available to crops. This is more or less true of those just mentioned, and is especially true of lime, common salt, magnesia compounds, and plaster, which latter, it will be remembered, is composed of sulphuric acid and lime. The sulphate of lime which is formed in superphosphates by treatment of bone phosphates with sulphuric acid, is doubtless, in many cases, a most efficient, and perhaps, sometimes, the most efficient part of the fertilizer.

How much of the different ingredients of plant-food which our soils are most apt to lack, is supplied by different fertilizers, is shown by the

CHEMICAL ANALYSIS OF FERTILIZERS.

The table below, with the explanations which follow, will perhaps be useful to those who are not familiar with the ways of estimating the value of fertilizers from analyses.

The articles mentioned were all, with the exception of the English superphosphate, bought and used last spring in considerable quantities by farmers in Connecticut. The samples were, with the same exception, furnished by the officers of the Middlefield and Westfield Farmers' Club. The numbers are those attached to the specimens as they are received at the laboratory.

TABLE 2.

INGREDIENTS CONTAINED IN 100 LBS. OF FERTILIZER.	NAMES OF FERTILIZERS.				
	No. 53.	No. 16.	No. 15.	No. 19.	No. 6.
	High grade English Superphosphate.	Guanape Guano.	Ammoniated Superphosphate.	Double Refined Poudrette.	"Superphosphate of bone."
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Water (Moisture), - - - - -	8.5	16.6	21.7	4.2	10.1
Organic and Volatile Matters, - -	26.7	42.3	24.8	17.3	14.8
Phosphoric Acid, - - - - -	32.0	17.5	14.0	2.2	2.6
Sulphuric Acid, Lime, and other Matters, not separately estimated, -	32.8	23.6	35.9	13.2	25.3
Sand, etc., - - - - - - -	None.	None.	3.6	63.1	47.2
	100.00	100.00	100.0	100.0	100.0
VALUABLE FERTILIZING INGREDIENTS IN THE ABOVE.					
Nitrogen in Organic Matter, - -	None.	9.37	1.67	1.41	1.02
Ammonia equivalent to Nitrogen, -	None.	11.38	2.03	1.71	1.23
Phosphoric Acid, soluble, - - -	23.3	5.8	9.9	None.	None.
" insoluble, - -	8.7	11.7	4.1	2.2	2.6
" Total, - - -	32.0	17.5	14.0	2.2	2.6
Bone Phosphate of Lime equivalent to total Phosphoric Acid, - -	69.85	38.8	30.6	4.8	5.7
Retail price per ton, - - - -	$61.00	$60.00	$42.50	$25.00	$55.00

MEANING OF THESE ANALYSES.

The WATER is that which dries out on heating. No. 16 has 16.6 per cent. or 16½ lbs. in every 100 lbs. of the fertilizer. No. 19 has only 4 per cent. The percentage of water in a fertilizer is a matter of considerable consequence. The larger the amount of water the less the other matter, and vice versa.

THE ORGANIC AND VOLATILE MATTERS are those which may be burned off after the water is removed. They are the so-called "*animal and vegetable matters*,"* and contain the *Nitrogen* of these fertilizers.

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* The volatile matters include, however, in some cases, water or other materials which are not removed in heating to 100–110 Centigrade.

If the ash which remains after drying and burning, be treated with strong acids, a portion will dissolve. This will include the *Phosphoric Acid*, the *Sulphuric Acid*, the *Lime*, and some other materials, as iron, alumina, and soda, whose proportions are not determined. The *Sulphuric Acid* and *Lime*, though valuable, are not sufficiently so to make them worthy of special account in analyses of high priced manures. The iron, alumina, etc., have no agricultural value.

SAND, ETC.—The residue, which resists the action of both fire and strong acids, consists of silica and other mineral matters. These possess no fertilizing value and are classified as *Sand*, etc. The Guanape Guano has practically none, while the Poudrette has 63.1 per cent., or 1262 pounds of *these worthless* matters to the ton.

PHOSPHORIC ACID SOLUBLE AND INSOLUBLE.—As has been explained, the characteristic of a superphosphate is the soluble phosphoric acid which it contains. In some super-phosphates a part of the Phosphoric which has been rendered soluble by treating the original "bone phosphate of lime" with Sulphuric Acid, undergoes a change in chemical combination by which it becomes less soluble. The terms REVERTED, reduced, and precipitated, are applied to it, when in this form. The reverted phosphoric acid ranks in solubility, and consequently in value, between the Soluble and the Insoluble. The Soluble and the Reverted are sometimes classed together, as *Available* Phosphoric Acid.

In some analyses the percentage of phosphoric acid is not stated separately, that of "bone phosphate of lime" being given in its stead. Sometimes the expression "soluble bone phosphate of lime" is met with, which is certainly a misnomer. As was explained above, the phosphoric acid occurs in the form of bone phosphate in bones and most mineral phosphates; 100 parts by weight of phosphoric acid unite with about 118 parts of lime to form 218 parts of bone phosphate; 100 parts or pounds of phosphoric acid are said therefore to be equivalent to 218 parts of bone phosphate. We lay especial stress on this point because those not familiar with chemistry are apt to be deceived in comparing analyses in some of which the term phosphoric acid, and in others the term bone phosphate is used. It would be more accurate and clear and in every way better to discard the term bone phosphate of lime in analyses of fertilizers, and speak only of phosphoric acid.

NITROGEN, AMMONIA.

In our ordinary fertilizers, much or all of the nitrogen exists in unavailable forms. By more or less rapid processes of decay in the soil these are changed to other compounds, of which ammonia is one, and which the plant can readily use as food. Fourteen parts by weight of nitrogen unite with three parts of hydrogen to form seventeen parts of ammonia. Accordingly, 14 parts of nitrogen are said to be equivalent to 17 of ammonia, or what is the same thing, 100 parts of nitrogen are reckoned as equivalent to 121 parts of ammonia. In pure sulphate of ammonia, all of the nitrogen is in the form of ammonia. In Peruvian guano, some of the nitrogen exists as ammonia also. In our other ordinary fertilizers, there is little or no ammonia. The very common practice of reckoning nitrogen as ammonia in fertilizers which do not contain it in this form is incorrect, misleading, and therefore wrong.

The amounts of phosphoric acid and nitrogen in the above fertilizers (which contain no considerable amounts of potash,) will appear very clearly if we state, instead of the percentages, the number of pounds in the ton. No. 15 for example, with 9.94 per cent. of soluble phosphoric acid would furnish [9.94x20] 199 pounds to the ton, and so on, as below:

NAMES OF FERTILIZERS.	POUNDS OF VALUABLE INGREDIENTS IN A TON.			
	Number.	Phos. Acid Soluble.	Phos. Acid Insoluble.	Nitrogen.
English Superphosphate, - - -	53	465.6	173.4	....
Guanape Guano, - - - - - -	16	115	233.8	187.4
Ammoniated Superphosphate, - -	15	199	82.0	33.4
Double Refined Poudrette, - - -	19	......	44.4	28.2
American Bone Fertilizer, - - -	6	......	52.2	20.4

VALUATION OF COMMERCIAL FERTILIZERS.

The *agricultural value of a fertilizer*,—the gain which will result from its use in a given case,—is subject to such varying conditions of soil, climate, culture, and crop, as to preclude the possibility of exact estimate. The *commercial value*, being dependent upon its composition and the state of the market, admits of more nearly correct calculation.

It is customary to make estimates of the commercial values by attributing to each of the important ingredients a certain value per pound. Thus, Prof. Johnson, chemist of the State Board of Agriculture, in his last report, assumes for phosphoric acid, soluble, 15 cents; reverted, 10 cents; and insoluble, 6 cents per pound; and for nitrogen in bone, 20 cents, and in ammoniated superphosphates and guano, in which it is generally more available, 25 cents per pound. At these rates, the 199 pounds of soluble phosphoric acid in No. 15 for instance, would be worth [15 cents x 169] $29.85, and so on. Applying these figures to No. 15 we should have the following calculations for the estimated value per ton of 2000 pounds:

VALUATION OF "AMMONIATED SUPERPHOSPHATE," NO. 15.

	Per cent.	Lbs. in ton.	At cts. per lb.	Valuation.
Phos. Acid, soluble,	9.94	199.	15	$29.85
" insoluble,	4.10	82.	6	4.92
" nitrogen,	1.62	33.4	25	8.35
				$43.12

The table below gives the values as thus calculated, together with the selling prices.

NAME OF FERTILIZER.	CALCULATED VALUES AND SELLING PRICES PER TON.					
	Number.	Phosphoric Acid soluble.	Phosphoric Acid Insoluble.	Nitrogen.	Total Calculated Value.	Selling Price.
English Superphosphate, - -	53	$69.84	$10.40	.....	$81.84	$61.00
Guanape Guano, - - - -	16	17.25	14.03	$46.85	78.13	70.00
Ammoniated Superphosphate, -	15	29.85	4.92	8.35	43.12	42.50
Double Refined Poudrette, -	19	.....	2.66	7.05	9.71	25.00
American Bone Fertilizer, -	6	.....	3.13	5.08	8.21	55.00

As Prof. Johnson has indicated, this method of estimating the values of fertilizers is not in all respects satisfactory. We are by no means prepared to say that in the fertilizers in the above table, six cents per pound for phosphoric acid, and twenty-five cents per pound for nitrogen, are correct valuations in Connecticut at this time. That these prices, if just for one case, can not be so for all, must be evident on a moment's reflection. The nitrogen in nitrogenous superphosphates, for instance, is derived from various materials. In some, as dried blood, it is very readily, in others, as leather scraps, it is slowly available to crops. A pound of nitrogen costs the manufacturer more, and is worth more to the farmer in dried blood than in leather. So, likewise, a pound of insoluble phosphoric acid is more valuable in Peruvian guano or in steamed and finely ground bone than in coarse, raw bone, and it is worth more in the last than in Navassa or South Carolina phosphates.

The prices here assumed are, as a whole, rather high for the present state of the market. When any farmer can obtain nitrogen at from eighteen to twenty cents per pound in Peruvian guano, and at not far from twenty-two to twenty-three cents per pound in dried blood, meat scraps, and the best nitrogenous superphosphates, twenty-five cents per pound would seem to be a high valuation. Fifteen cents per pound is likewise high for soluble phosphoric acid. It is offered in superphosphates prepared from South Carolina phosphates at 11½ cts. per lb. For insoluble phosphoric acid, six cents per pound in Peruvian guano and in steamed and finely ground bone-dust is doubtless low. For coarse raw bone, it is probably too high. For insoluble phosphoric acid in South Carolina, Navassa, and other fossil and mineral phosphates, a just valuation would probably not exceed four cents per pound.

Any scale of valuations which does not recognize the difference in value of the same ingredient in different combinations, must be imperfect from the commercial, and still more so from the agricultural, stand-point. A schedule of prices which shall recognize this difference and approach as nearly as practicable to just estimates, is a great desideratum. With our limited experience, we do not at present feel warranted in assuming a new scale of valuations, but adhere to that already in use in the State, swerving from it only in so far as to rate insoluble phosphoric acid in fossil and mineral phosphates at four cents, for potash as sulphate eight cents, and as chloride six and one-quarter cents per pound.

Reserving the further discussion of this topic for a future occasion, allow me to call attention to another method for comparing these fertilizers one with another, and one which is open to less objections.

Assuming *ratios* of value in accordance with the scale mentioned, and applying these with the selling prices to the analytical results above, by a process analagous to what is known in arithmetic as alligation, the following figures are deduced for the actual costs of the valuable ingredients per pound.

NAMES OF FERTILIZERS.	ACTUAL COST PER POUND, IN CENTS, OF THE VALUABLE INGREDIENTS OF THESE FERTILIZERS WHEN BOUGHT AT PRICES STATED.			
	Number.	Phos. Acid Soluble.	Phos. Acid Insoluble.	Nitrogen.
		Cts.	Cts.	Cts.
English Superphosphate, - - - -	53	11.5	4.6	....
Guanape Guano, - - - - - -	16	12.3	5.3	22.0
Ammoniated Superphosphate, - -	15	14.8	5.9	23.8
Double Refined Poudrette, - - -	19	....	15.5	64.5
Superphosphate of Bone, - - -	6	....	40.0	167.0

HIGH AND LOW PRICED FERTILIZERS.

The above table is worthy of most careful study. The soluble phosphoric acid of No. 53 costs 11½ cents, and of No. 15, 14⅘ cents per pound. The insoluble acid varies from 4¾ to 40 cents per pound. And while a pound of nitrogen costs 22 cents in the guano, in the poudrette it costs 64½ cents.

In the table of analyses at the end of this article, the cost of valuable ingredients in a large number of fertilizers sold in Connecticut is given as calculated upon this plan. Taking the table through, the nitrogen varies from 15 cents to $1.67 per pound. In nitrogenous superphosphates, it runs from 22¾ to 44½ cents. It is often least costly in the forms in which it is most valuable.

A curious and instructive instance of this variation is found in Nos. 120 and 102. The nitrogen in No. 120 is stated by the manufacturers, and without doubt truthfully, to be furnished in dried blood and bone. That in No. 102 is from dried blood, bone, and meat. The nitrogenous material is practically the same in both. The nitrogen in No. 120 costs 42½ cents and that of No. 102 only 21⅗ cents per pound.

Now the good, sensible farmers of Connecticut know very well whether or not to give forty-two cents a pound for coffee, when they can get an equally good article for twenty-one. No one of them will pay a given price for cloth of a given manufacture, when he can get it of another manufacture and just as good or better for a price one-half or three-fourths or seven-eighths lower. If he were obliged to take his cloth and coffee so done up in packages that he could not get access to them to judge of their quantity or quality; if he were obliged to select on the strength of general experience, or at hap-hazard, he would have to be content to take his chances with the articles as they came. But if the opportunity came to learn what the goods actually were, would it not be wise in him to accept it, and select those which were best and cheapest? And when dealers found that he and his neighbor were buying in that way, would not a competition ensue based upon goodness of quality as well as lowness of price? and would not this competition be a healthy one for all concerned?

Such a comparison as the above is fair, as far as it goes, for the better class of fertilizers, but it fails to meet so aggravated a case as that of the poudrette. Here the buyers not only paid 15½ cents for every one of the few pounds of insoluble phosphoric acid, and 64½ cents for each pound of nitrogen, but with every ton of the fertilizer they put on their land, they had to haul and handle 1,262 pounds of sand and the like, which neither fire will burn nor the strongest acid dissolve, and a quantity of fragments of wood and coal, and other equally worthless material besides.

There are many soils in Connecticut in which readily available nitrogen is so useful that the 1½ per cent. in the poudrette will stimulate the early growth of some crops enough to encourage farmers to use even such a fertilizer. "Just a little of it in the hill at planting time will not hurt the crop a bit and will sometimes start it off remarkably." But would it not be better to get the nitrogen at from 18 to 25 cents per pound in guano, dried blood, fish, slaughter-house refuse, sulphate of ammonia, or nitrate of soda, and soluble phosphoric at from 12 to 15 cents per pound in high grade superphosphates—and carry home as much in a couple of bags under the seat of a single wagon as would be contained in a ton of the poudrette, leaving the 1,300 pounds of sand and brick and coal and wood behind, and cost of freight and hauling with them, to compost the concentrated materials with loam, or better, good rich muck, and thus get a fertilizer which would not be strong enough to hurt the crops, yet would start them along as well as the poudrette, and would not cost half as much?

No. 6 of the table is a very good example of

FRAUDS IN FERTILIZERS.

Two samples of this have been received from farmers in this vicinity, who state that it was sold and used in considerable quantities last spring, in this and adjoining towns.* It was called the "American Bone Fertilizer," and was represented by the agent to be a "first-class superphosphate," "equal to Peruvian guano," an excellent fertilizer for tobacco, corn, and other crops. No perceptible benefit appearing from the use, samples were brought to the station for analysis.

The two specimens, taken from lots used by two different farmers, showed essentially similar composition. The best superphosphates contain from 12 to over 20 per cent. of phosphoric acid, of which from 6 to 12 per cent. or more is soluble. This contained a trifle over 2½ per cent., of which no appreciable quantity was soluble. A good quality of Peruvian guano will contain 8 per cent. or more of nitrogen. This article contains 1 per cent. The best guanos and superphosphates contain from none to 8 per cent. of sand, etc. This contained 47.2 per cent. or 947 pounds to the ton. It has the appearance of salt-marsh muck mixed with sugar house scum, the latter a material of little agricultural value, which is sold in New York, as we are informed, at $5.00 or thereabouts per ton. The estimated value was $8.23 per ton. That is to say, the valuable ingredients furnished by one ton of this fertilizer could have been bought for $8.23 or less in any of the best phosphates, or bone manures, or guanos sold in the State. It was sold at $55.00 per ton, a discount being made from $60.00, "to introduce the article."

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* Before the establishment of the Station.

The parties furnishing the samples state that Messrs. Birchall & Chapman of Port Morris, N. Y., claim to be the manufacturers, that it was sold to them by a person named W. B. Knapp, who represented himself as a sub-agent and I. N. Leonard of Elizabeth, N. Y., as general agent, and that the latter person has also visited them in this capacity to recommend the article, and attend to the collection of the bills. The truth of these statements is amply confirmed both by the character of their authors and by documents bearing the names and signatures of the manufacturers and sellers.

We are informed that, upon receipt of the results of the analyses of the American Bone Fertilizer, the purchasers who had not paid for the article very justly refused to do so. In view of the fact that the sellers, should they appear in the State, are liable to prosecution and fine for violation of the State law which required that fertilizers offered for sale in the State shall be accompanied by a "correct analysis," a suit on their part to recover payment is hardly to be anticipated.

As has been said, all the articles mentioned in the preceding Tables except No. 53, were sold and used in considerable quantities last spring by farmers living within five miles of here.

At that time some analyses were being made at our laboratory of fertilizers bought of a prominent New York house who have always sold their wares with guarantee of composition. In reply to a suggestion that they should import some of the high grade English superphosphates, which they afterwards did, (No. 53,) they inquired whether the farmers of the State "were educated up to the point where they would give the preference to such articles."

The following brief statements will answer in part at least, some of the numerous inquiries received at the station, which have not been answered in the preceding. For composition and value of articles mentioned, see table at the end of this pamphlet.

BONE MANURES.

The fertilizing value of bone is due largely to the phosphoric acid, and, in a less degree, to the nitrogen which it contains. Bones contain besides a small quantity of WATER, two kinds of material, the so-called "ORGANIC MATTER," which contains Nitrogen, and may be burned away, and the "MINERAL MATTER," or Ash which remains after burning.

The mineral matter consists chiefly of PHOSPHATE OF LIME, a compound of PHOSPHORIC ACID and LIME, and contains also a small quantity of carbonate of lime and other compounds. Bone fertilizers, even when unadulterated, contain also more or less of materials insoluble in acids, which are classified as SAND, etc. Among materials said to be used for adulterating bone are lime, (often from oyster shells,) plaster (sulphate of lime), and salt-cake or niter-cake (an impure sulphate of soda, containing some common salt). Some manufacturers, however, make no secret of adding salt-cake to bone which has been boiled to extract the fat, it being useful to dry the fertilizer and prevent putrefaction. When plainly stated this cannot be called fraudulent. The composition of some of our bone manures is illustrated by the following table.

COMPOSITION AND VALUATION OF BONE MANURES.

TABLE 3.

INGREDIENTS.	No. 77.	No. 94.	No. 96.	No. 107.
Moisture, - - - - - - - -	9.66	7.00	16.05	12.37
Organic or Animal Matter,* - - -	42.19	33.25	27.35	39.98
Phosphate of Lime,† - - - -	46.32	51.54	31.93	27.02
Other Mineral Matters, - - - -	1.83	8.26	24.67	20.63
	100.00	100.00	100.00	100.00
†Containing Phosphoric Acid, - - -	21.22	23.61	14.62	12.38
*Containing Nitrogen, - - - -	3.38	3.88	2.36	3.99
Estimated Value, per ton, - - -	$38.98	$43.85	$26.68	$30.81
Selling Price, " - - -	‡48.00	33.00	35.00	47.50
Actual cost of Phosphoric Acid, per lb.,	7⅖ cts.	4½ cts.	7⅘ cts.	9¼ cts.
" " Nitrogen, " -	24¾ cts.	15 cts.	26 cts.	30¾ cts.

No. 107 is claimed by its name "Dissolved bone," to be a superphosphate, but contains no soluble phosphoric acid, and is therefore not a "dissolved bone" at all.

Comparing 94 and 96, which are very good examples of high and low grades of ground bone, we notice that the amounts of water are very different in the two articles, No. 94 containing 7, and No. 96, 16 per cent. The greatest differences appear in the "Phosphate of Lime," 51½ per cent. in No. 94 and 32 per cent. in No. 96, and other mineral matters 8¼ and 24⅓ per cent. The percentages in 94 are very favorable, and indicate a quite pure article. But 31.2 per cent. of Phosphate of Lime in No. 96 is too little, and 24¾ per cent. of other mineral matters is too much for a pure bone.

The values are calculated in the manner described above, page 382, insoluble phosphoric acid being assumed to be worth six cents, and nitrogen twenty cents per pound. On this basis of valuation No. 94 is worth $10.85 more, and No. 96 $8.02 less, per ton, than the selling price. The estimated value of No. 96 is only three-quarters of the price charged.

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‡ In accounts received this is implied, but not definitely stated, to be the price of this article in Connecticut.

As has been stated, this method of estimating the values of fertilizers is not in all respects satisfactory. We are by no means prepared to say that six cents per pound for insoluble Phosphoric acid, and twenty cents per pound for Nitrogen in bone manures, are correct valuations in Connecticut at this time. These prices are, doubtless, not far from just. That they cannot be exactly so for all cases, is clear from a comparison of different articles. Some contain a great many coarse lumps of bone, as large as a pea or larger, the amount of really fine material being comparatively small. In others, fragments as large as a grain of wheat are rare, and much of the material is as fine as ordinary corn meal. The large lumps would lie in the ground for years before they would decompose and their phosphoric acid and nitrogen be rendered available as food to the plant. But the fine bone-dust could be more uniformly diffused throughout the soil, and quickly used by the crop, and thus bring a much speedier return for the money it costs. In rates of valuation current in Germany, where these subjects have received much more attention than with us, nitrogen in coarse raw-bone is reckoned at about 12½ cents per pound, while in a steamed, finely powdered bone dust it is rated at about 21 cents per pound.

There is a common, but erroneous impression that steamed bone is less valuable than raw bone. It is true that in the process of boiling or steaming bones to remove fats, or "grease," there is also some loss of nitrogen, but as the total weight is decreased without any considerable loss of phosphoric acid and but little loss of nitrogen, the percentages of these are found in practice not to vary greatly from those in pure bone. The steamed bone is left in a very friable condition, so that being more easily ground, it is usually much finer, and much more quickly available to plants. In brief, fine bone is much more valuable than coarse, and steamed than raw, because they are more quickly decomposed, and therefore bring a quicker return for the money invested. The effect of finely ground steamed bone may not be manifest during more than three or four years; while that of coarse fragments of raw bone will be much less marked but may last a life time. Most of the phosphoric acid will remain in the soil until removed by plants; but much of the nitrogen will, after a time, leach out in drainage water, or escape into the air.

No. 77 is a very good example of a fine steamed bone, as No. 94 is of a rather coarse raw bone. Each is excellent of its kind, and they afford a very good illustration of the fact already referred to, that the estimated values do not represent agricultural values. Reckoning phosphoric acid at 6 cents, and nitrogen at 20 cents per pound, the fine steamed bone foots up $38.98, and the coarse raw bone, $43.85 per ton. At the same time the valuable ingredients of the steamed bone are much more available than in the other, and really worth more. No. 77 is, in fact, from the agricultural standpoint, without doubt, the most valuable specimen we have yet analyzed. If valuations current in Germany, and based upon the best European experience be correct, the farmer who wants quick returns for the money invested could as well afford to pay $48 per ton for this, as one-fourth or possibly one-third less for the very coarse grades of raw bone.

Where permanent results are desired, and slow action will suffice, the coarse raw bone may be used to advantage, particularly if obtained at prices enough lower to make up for interest on capital invested. In general the higher grades of these bone manures are the cheapest. They should contain from 20 to 23 per cent. of phosphoric acid, and 3½ to 4 per cent. of nitrogen.

We are informed that the manufacturers of No. 96 (Lister Bros., of Newark), state freely that they mix salt-cake, or niter-cake, with their ground bone. In eight samples of their bone manures examined by Prof. Johnson (Report of Conn. Board of Agriculture, 1873) the quantities of matters dissolved by water, chiefly soda-salts [salt-cake or niter-cake], were found to vary from 17 to 32 per cent. The calculated values of these samples varied from $18.76 to $32.84 per ton, ranging from $7.16 to $18.20 below the selling prices. It should be said in favor of these manures, however, that they are for the most part quite finely ground, and their mechanical condition is good, while the salt-cake is doubtless not without value in rendering other materials available or aiding in their distribution through the soil. They have the appearance of having been either thoroughly boiled or steamed, and their phosphoric acid and nitrogen would doubtless be much more readily available than those of Nos. 94 and 107.* This is another of the cases in which the estimated values do not express correctly the relative agricultural values, and the estimated cost of the individual ingredients per pound, afford more just means of comparison. Still we must say of our analytical results, as Prof. Johnson does of his own, that "the figures demonstrate in the most striking manner the loose way in which the traffic in fertilizers is conducted, and show the necessity of basing transactions upon chemical analysis, if consumers expect to get the worth of their money."

This latter fact is illustrated in the most clear and decisive manner in the estimated costs of the nitrogen and phosphoric acid per pound in the manures of the table on page 384. Nos. 94 and 107 were both raw bone, the latter being the finer of the two. But the nitrogen in No. 107 costs 30¾ cents per pound, and in No. 94 only 15 cents per pound. The phosphoric acid costs also about twice as much in the 107 as in 96.

In choosing between such articles as Nos. 77, 94, and 96, the buyer should consider whether he can better afford to pay for nitrogen and phosphoric acid, respectively 25 and 7 cents per pound for those in the fine steamed bone whose action will be quicker, or 15 and 4½ cents in the coarse raw bone in which they will become available more slowly. In deciding whether he shall select such articles as No. 96 or not he has still another problem to solve; namely, whether or not the salt-cake, 150 to 300 pounds or so to the ton, by Prof. Johnson's figures, and our own, is worth enough to him to pay for its own handling and that of the extra amount of water, say from six to 12 per cent., or 120 to 240 pounds to the ton, which they contain.

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* Four samples of these manures were found to contain each a small amount of soluble phosphoric acid, the percentages varying from 1 to 1⅖ per cent. not enough to be worthy of special account in the table.

FISH MANURES

are chiefly valuable as sources of nitrogen, though they contain considerable phosphoric acid also.

Several samples of fish guano, but only two of fish scrap, have been received for investigation. Analyses of a number are given in the final table.

The composition of fish scrap is quite variable, particularly in the percentages of moisture and nitrogen. No. 131 of the table was considered by farmers in this region as a fair average article, except that it was much drier than ordinary. It contained about 25 per cent. of moisture, 7½ per cent. of phosphoric acid, and 5½ per cent. of nitrogen. Taking phosphoric acid at 6 cents, and nitrogen at 20 cents per pound, the calculated value would be $30.93. The price paid for it last year was $16.00 per ton, which would make the cost of the phosphoric acid 3.1 cents, and that of nitrogen 10⅛ cents per pound. No. 103 contained 41 per cent. water, 6¼ per cent. phosphoric acid, and 5⅛ per cent. nitrogen. The estimated value is $28.79. At $16.00 per ton the nitrogen would come to 11.1 cents, and the phosphoric acid 3.3 cents per pound. At $16.00 per ton, such articles as the above would furnish nitrogen and phosphoric acid at lower rates than any other fertilizers we have examined. At the present time, however, in some parts of the state at least, they could hardly be sold at that price.

PERUVIAN GUANOS

are ordinarily ranked as nitrogenous fertilizers, though they furnish phosphoric acid in considerable, and potash in small quantities. All these ingredients are in quite available forms. Peruvian guano as sold in our markets has been somewhat variable in composition, and farmers have complained of lumpiness, which renders uniform distribution in the soil difficult or impossible. The phosphoric acid, though more available than in many of our commercial fertilizers, is only partially soluble. Very fortunately for the users of this necessary article, Messrs. Hobson, Hurtado & Co., agents of the Peruvian Government for the sale of guano, have introduced into this country the "Rectified" Peruvian guano, whose value is attested by a constantly increasing use in Europe for a number of years.

In the preparation of this article, lots of varying composition are mixed, treated with sulphuric acid and pulverized. Among the advantages of the Rectified guano are, that it has a uniform composition, that nearly all the phosphoric acid is soluble, the ammonia is converted into the sulphate, in which form it is not liable to escape as in natural guano, the mechanical operations involved give a finer texture, which permits a more even distribution, and finally the price is such as to furnish the valuable ingredients at lower rates than any other fertilizer containing them in equally valuable forms, which we have examined. In answer to numerous inquiries we can simply say to those who will use Peruvian guano, that the "Rectified," as guaranteed, is to be highly commended. It is sold with a guarantee of 8⅓ per cent. nitrogen (equivalent to 10 per cent. ammonia), 10 per cent. soluble phosphoric acid, and 2 per cent. potash.

POTASH—THE "GERMAN POTASH SALTS"

from the mines at Stassfurt, are at present the most important source of potash for agriculture. There are various grades of these, characterized by the amounts of potash and other ingredients they contain. The poorest grades contain as low as 7 or 8 per cent. of potash (potassium oxide), the highest 50 per cent. or more. Unfortunately a large part of the German potash salts imported into this country are of the lower grades.

The potash salts as taken from the mines contain comparatively little potash, and a good deal of other materials. They are subjected to chemical treatment by which more or less of other constituents are removed. As prepared for the market, they contain, besides compounds of potassium, common salt, and other materials of little agricultural value, including more or less chloride of magnesium. The lower grades of the manipulated salts have, of course, considerable of these latter compounds. The same is true of the unmanufactured kainit. The chloride of magnesium is known to be injurious to plants. How much injury it does, if any, in the amounts and way in which it is ordinarily applied in the use of the low grade German potash salts, is not definitely settled. The higher grades have little or no chloride of magnesium, little common salt, and potassium compounds corresponding to 35 to 50 per cent. or more of potash.

It will be remembered that potash, or potassa, is the compound of the metal potassium with oxygen. This combined with sulphuric acid, forms sulphate of potash. Potassium and chlorine together form chloride of potassium, or "muriate of potash," as it is called by dealers.

By adding to ordinary potash lye from ashes a proper amount of sulphuric acid and boiling the liquid down, we might, with proper care, obtain a solid substance, which would be a sulphate of potash. If we were to use hydrochloric (muriatic) acid instead of sulphuric, we should obtain a chloride of potassium or muriate of potash. In some of the German salts the potassium is present as sulphate of potash, and in others as chloride of potassium. It is customary to reckon the potassium of these salts as "actual potash." In the sulphates this term expresses the amount of potassium oxide, potassa, or potash present. In the muriates it represents the amount of potash which the potassium would make if it were combined with oxygen instead of chlorine.

100 lbs. of pure sulphate of potash contains about 54 lbs. of "actual potash." 100 lbs. of sulphate of potash are therefore said to be equivalent to 54 lbs. of actual potash, and vice versa, 54 lbs. of potash in the sulphates are reckoned as equivalent to 100 lbs. of sulphate of potash. In the "muriates" 100 lbs. of chloride of potassium are reckoned equivalent to about 63 lbs. of potash and vice versa.

Of the German salts, the sulphates are, on the whole, preferable, but the potassium in these is more costly than in the chlorides. The chlorides sometimes injure the burning quality of the leaf of tobacco, and decrease the amount of starch in potatoes, and of sugar in sugar beets, while the sulphates are always safe; but for grains, grass, and other fodder-crops, and for wet soils, the muriates are highly recommended. The potash in all these is soluble.

The potash salts are generally most useful when applied with phosphates and nitrogenous fertilizers. It is of the greatest importance that they be uniformly distributed through the soil before the seed is put in. It is well, therefore, to mix them with earth and apply either in the fall or very early in the spring, before planting or sowing.

In Germany, where the potash salts have come into general use, quantities corresponding to 200 to 500 pounds of the higher grades, and from 300 to 600 pounds of the lower grades to the acre are recommended.

Satisfactory accounts of the German potash salts thus far analyzed would require more space than the limits of the present article will allow. Our experience, however, justifies us in joining heartily with Prof. Goessman, State Inspector of Fertilizers for Massachusetts, in recommending, for chlorides, the high grades with from 80 to 84 per cent. of potassium chloride, equivalent to 50 to 53 per cent. of potassium oxide or "actual potash," and for sulphates the highest grades, which contain from 52 to 56 per cent. of sulphate, or 28 to 30 per cent. of potassium oxide, and have the additional advantage of furnishing considerable sulphate of magnesia, which latter compound, besides being useful as plant food, facilitates the diffusion of the potash through the soil. The high grade artificial kainit which may be obtained with 30 to 32 per cent. of sulphate of potash, is also to be recommended.

These articles may be obtained at prices such as to furnish actual potash at a little over 6 cents per pound in the chloride, and at about 8 cents per pound in the sulphates; these calculations being based upon the supposition that the other materials have no value. The low grades have been sold at such prices as to bring the potash at from 9 to 30 cents or more per pound. The cost for freight and handling of a ton of the low grade salts with 200 pounds of potash, is as great as for a ton of the high grade with 600 to 1,000 pounds of potash. Unless, therefore, the farmer wants a large quantity of common salt and magnesium compounds, and is willing to pay for them, the high grades must, on this side of the Atlantic, be decidedly the cheapest.

The primary duty of the chemist is to make analyses and experiments, and to refrain from offering practical advice until his theories have a substantial basis of known facts. At the same time it may not be out of the way to offer a few suggestions for the thoughtful consideration of Connecticut farmers.

In saying that no plant can grow, no crop can flourish without an available supply in the soil of a sufficient quantity of each one of a certain list of substances needful for its food, and that the essential use of commercial fertilizers is to supply food which plants need and soils fail to furnish, we are simply repeating universally admitted facts. It is perfectly plain, then, that those commercial fertilizers will be most economical which, in one way or another, supply these lacking materials in the needed proportions, the best forms, and at the lowest cost.

We have, therefore, two most important problems to solve. First, what materials do our soils lack? second, by what applications of fertilizers or other means will their need best be supplied?

To answer either of these questions fully and definitely, is very difficult; the first, because of the difference in soils, and both because we do not know, and do find it slow work to discover definitely, the ways in which atmosphere and soils and fertilizers supply food, and plants use it.

It is sufficiently well settled, that nitrogen, phosphoric acid, potash, sulphuric acid, lime and magnesia are the only ingredients of plant-food which need to be supplied in fertilizers. The other materials, as iron, silica, and chlorine, which plants remove from the soil, are, in so far as they are necessary for plant-food, furnished in abundance by every ordinary soil.

Generally speaking, we may accept the opinion commonly held that magnesia may sometimes be lacking, that sulphuric acid and Lime are more, and nitrogen, phosphoric acid and potash most apt to be deficient in our ordinary soils. In one soil one, in another, several or all of these may be wanting.

It was once thought that the chemical analysis of a soil would easily reveal its deficiencies in plant food. But later experience has shown this is at best a costly and defective source of information. Different samples of soil from the same field may vary widely in composition, and, what is a still greater difficulty, the chemical tests which make known the presence of a given ingredient in the soil, do not show whether it is in a form such that the plant can use it. And there are many processes of vital importance to the sustenance of the plant which are continually going on in the soil, but which the analysis does not reveal.

Most of our artificial manures are only special fertilizers. Guanos, phosphates, fish and bone manures and the like, contain more or less nitrogen, phosphoric acid, and lime; the superphosphates contain sulphuric acid, also. With the exception of some to which German potash salts have been added, very few of them contain any appreciable quantities of magnesia or potash. They supply part but not all the materials which soils may lack.

Many farmers find that guano, fish and other special fertilizers whose action is quick and stimulating, seem to leave their soil in a more exhausted condition than before they were applied. And the complaint is not uncommon that such fertilizers do not bring the same return as formerly.

May we not at least question whether the immediate effect of these special fertilizers has not been, in many cases, to aid the plant to use the more available stores of food in the soil, until these latter have become so far exhausted as no longer to respond to the stimulating action of the special manures?

If the above supposition be correct, it is clear that what such exhausted soils need, is something to supply, not only the nitrogen and phosphoric acid of the guano, or fish, or bone, or superphosphates, or other special fertilizers, but also the potash and other materials that these latter do not furnish.

Ashes are, for many soils, a standard fertilizer. Places where a tree or a brush-heap has been burned, often show the effects of the manuring for years. It is a trite saying, that "The land never forgets ashes." Ashes supply directly all the soil ingredients of plant-food except nitrogen. Their indirect action is also, very likely, not unimportant in rendering other materials in the soil available. Instead of wearing out soils, they strengthen them. May not this difference be due, in part at least, to the fact that they furnish the other ingredients of plant-food that the guano and fish lack?

Stable manure furnishes all the ingredients of plant-food. It is a complete fertilizer. Farmers do not complain that it helps to exhaust their land.

There are soils which, by applications of nitrogen and phosphoric acid, in the form of guano, bone or nitrogenous superphosphates, may be made to bear good crops year after year. They supply of themselves the other materials needed. They have abundant stores of magnesia and potash, and so on, and by weathering, tillage, and the action of the fertilizing materials added, these are worked over from unavailable forms into those which the plant can use.

But such is not always the case. Among the exhausted and worn-out soils of New England, there are a great many which lack more than nitrogen, phosphoric acid, sulphuric acid, and lime.

This is very strikingly illustrated in the elaborate experiments of Prof. F. H. Storer, at the Bussey Institution, at Jamaica Plain, Mass. These were made upon what Prof. Storer calls "a very good representative of the light, leachy soils that overlie gravelly drift in New England. In these experiments, which continued through a series of years, different crops were raised with different manures, the same crop being grown with the same manure, on the same plot, year after year. Those raised with fertilizers containing nitrogen and phosphoric acid only, showed very little good effect from the manuring, while the potash compounds brought the most satisfactory returns. As Prof. Storer says, the "crying want" of this land was for potash. There are doubtless many such soils in Connecticut.

WHAT FERTILIZERS TO USE. A MATTER OF EXPERIENCE AND EXPERIMENT.

Some time ago, an intelligent farmer asked the writer which were the better fertilizers, phosphates or potash salts. The reply was, and I knew no better one, "potash salts, where potash is needed, phosphates, where phosphoric acid is needed, and nitrogenous manures, where nitrogen is needed. But if you do not know what your soil lacks, and want to make sure of a crop, and enrich your land at the same time, use your nitrogenous superphosphates, and German potash salts together. The former will furnish nitrogen, phosphoric acid, sulphuric acid and lime, the latter, potash and magnesia. Thus you will have a fertilizer with all that the plant needs, a complete manure. At the same time it is well to remember that you may feed your crops, not only directly by giving them these ingredients in guano, phosphates, potash salts, and so on, but indirectly by rendering stores of plant-food, present in the soil or atmosphere, available through tillage and the use of cheaper fertilizers. A little lime or plaster may sometimes be thus more valuable than an amount of phosphates or potash salts that would cost several times as much."

Stable manure is a complete fertilizer. It contains all the ingredients of plant-food, and its organic matter improves the mechanical condition of the soil besides. It is a standard fertilizer, and useful everywhere. By what artificial fertilizers this can be most profitably supplemented, is best learned by experience and experiment.

For farmers who have not their own experience, or that of others in like circumstances, to guide them, the most sensible plan would seem to be to try experiments on a small scale, with different trustworthy fertilizers of high grade. The ones that prove most satisfactory, can then be used with confidence, in large quantities. For instance, for nitrogen, dried-blood and sulphate of ammonia, or nitrate of soda, could be employed. Phosphoric acid would be furnished in high grade superphosphates, and potash in German potash salts. By mixing two or three of these together any desired combination, as phosphoric acid and nitrogen, phosphoric acid, nitrogen and potash, etc., could be made. It would be well for the sake of comparison, to use lime, plaster, and stable manure also, each kind of fertilizer being applied on a separate plot. Such parallel trials, particularly when repeated in successive years, with different crops, will give the surest indication of the needs of the soil and crops, and the best means to supply them. Should the plan meet with sufficient encouragement, the Station will arrange with some of the manufacturers whose wares are sold under its supervision, to have small lots of high grade fertilizers, such as suggested, put up in small packages, and sold at low prices, for experiments. Each lot of "experimental fertilizers" will be accompanied with descriptions and directions for experiment, so that the user may, by proper care, with comparatively little expense, test the special wants of his own fields and crops.

Such experiments have, at least, this much in their favor. They are entirely rational, and they have been approved, or rather, originally proposed by the best European and American students of Agricultural Science. To make them entirely satisfactory, will require more labor, and care, than many farmers will be inclined to devote, but in the long run would this not pay? And would not the instruction they would bring, be valuable, even to those who should not carry them out completely?

As has been shown, very few of our artificial fertilizers supply all the necessary ingredients of plant-food, and they are particularly deficient in potash. It seems to be well established, that potash is deficient in many soils in New England, as well as elsewhere. Some soils have a continued resupply from the decomposition of granitic or other rocks. These are, however, of limited extent. In lack of definite knowledge it is fair to presume that our common nitrogenous and phosphatic fertilizers would often be much more beneficial if potash were substituted for some of the phosphoric acid or nitrogen, and it is a serious question whether manufacturers of fertilizers that are to be used on various soils indiscriminately will not best serve the interests of their customers by preparing fertilizers containing a more complete list of the essential ingredients of plant-food, and particularly with more potash.

Some of the fertilizers analyzed at the Station show quite fair percentages of potash. This is usually supplied in the form of German potash salts, which contain magnesia also. A nitrogenous superphosphate to which such salts have been added, furnishes all of the materials of plant-food which our ordinary soils can lack, and is, in that respect, a complete fertilizer.

For general and indiscriminate use, viewing the matter from the chemist's standpoint, such fertilizers are to be very highly recommended. They will doubtless be, in many cases, much more economical to farmers than others which furnish only part of the materials needed, though at lower rates.

From what has been said in the previous pages, it is clear that

THE WAY FOR THE FARMERS OF CONNECTICUT TO GET RELIABLE FERTILIZERS

is to,

1st. Buy only those fertilizers whose chemical composition is distinctly stated and guaranteed by the seller; and

2d. Of these, to select the ones which furnish the fertilizing ingredients their land and crops need, in the best form and at the lowest price per pound.

If they are not certain that the articles they purchase are equal to the guarantee, let them send carefully and fairly chosen samples to the Station for analysis.

In brief, let buyers and sellers know what is the composition of their fertilizers and give preference to those in which, not the whole bagfull or ton, but the valuable materials contained therein, are the cheapest. In this way, poor and fraudulent articles will be driven from the market, honest dealers will be encouraged to sell and progressive farmers to use good articles, and tens of thousands of dollars will be saved every year to them and to the State. By such means and by such means alone, can the much needed regulation of the trade in commercial fertilizers be brought about.

Some details of the steps taken by the Station to aid the farmers of Connecticut in the purchase, and at the same time to encourage honest dealers in the sale of reliable fertilizers, may be found below.

THE CONNECTICUT FERTILIZER CONTROL SYSTEM.

The following form of agreement is the result of the deliberations of a large meeting of manufacturers, sellers, and consumers of fertilizers, held at the Station, and of consultation with the Advisory Committee and with other parties interested.

BLANK B.

.... hereby agree with the Connecticut Agricultural Experiment Station, as represented by its director, that all fertilizers offered for sale in the State of Connecticut, by .... or by........ authorized agents, at any price above fifteen dollars ($15.00) per ton, except crude fish-scrap, shall be placed under its supervision in the following manner:

1. ....hereby agree that all fertilizers above described shall be guaranteed to contain certain minimum percentages of one or more of the following ingredients:

Nitrogen.
Phosphoric Acid (1); Soluble (2).
Phosphoric Acid; Reverted (3).
Phosphoric Acid; Insoluble (4).
Potash (5).
Sulphuric Acid. Chlorine (6).

(1). Anhydrous Phosphoric Acid or Phosphoric Oxide, P_2O_5.

(2). In any form of combination soluble in distilled water.

(3). In any form of combination soluble in a neutral solution of Ammonium Citrate at a temperature not exceeding 100 Fahrenheit.

(4). In any form of combination not soluble as above.

(5). Anhydrous Potassium Oxide K_2O, or its equivalent Potassium, in any form of combination soluble in distilled water.

(6). Anhydrous Sulphuric Oxide SO_3, Chlorine, Cl; the same being of importance in Potash Salts for distinguishing between "Sulphate" and "Chloride."

The object of these specifications (1–6) is simply to define, in chemical language, the terms "Phosphoric Acid," "Soluble," "Reverted," &c., as ordinarily employed.

2. ....also agree that the above guarantee shall be always subject to verification by analyses made at the Station.

3. ....also agree that all fertilizers above described shall be at all times open to the inspection of the Station, as represented by its Director, Chemists, or any member of its Advisory Committee.

Signed.

Date.

Note.—The signer or signers will insert in the proper blank spaces their names (of person, firm, or corporation), and the pronouns I or we and myself and my or ourselves and our.

As filled out, this would read, I, A. B. or we, C. D. & Co., hereby agree, &c., and would be signed, A. B., or C. D. & Co. The chemical terms used in the specifications are not very familiar to others than chemists but are put in the above form so as to define accurately the terms used, and thus leave no opportunity for perversion or mistake.

The signer of this agreement is not expected to specify in this blank the composition of the wares he sells, but he does bind himself to fulfill the requirement of the State law, by accompanying every package of fertilizer sold, with a plain statement of the analysis, using the above terms, and to guarantee the article to be equal to the analysis.

In brief, this agreement binds the signer simply to state what he sells and guarantee what he states, the verification of the statement being left to the official analysis of the Station. With the fulfillment of this guarantee the responsibility of the seller will naturally end. The Station provides that buyers who wish to determine whether the articles they purchase are equal to the guarantee, may have control analyses made at little or no expense. It is believed that no simpler or more efficient way can be devised to place the trade in fertilizers on a secure basis, insure confidence, and benefit all concerned.

It is gratifying to observe the readiness with which a majority of the more prominent manufacturers and sellers of the State, and a number of those outside the State, have expressed their willingness to sign this agreement. Indeed, one of our largest fertilizer manufacturing companies has for some years been conducting its business upon the same principles, which form the basis of our present control system, having guaranteed its goods on analyses made by the Chemist of the Board of Agriculture. It is worthy of note that the fertilizers made and sold by those who have been most ready to join in this arrangement are among those which appear the best in the comparison of composition and prices.

The following list includes those who have already signed the above agreement. Others have signified their intention to do so. Their names will be duly published when received.

IN CONNECTICUT.

Quinnipiac Fertilizer Co., New Haven.
Strong, Barnes, Hart & Co., "
George W. Miles, Milford.
C. L. Willard, Hartford.
Rodney Kellogg, "
F. Ellsworth, "
Leonard B. Bishop, New Haven.
Robert B. Bradley, "
John P. Barstow, Norwich.
Southmayd & Gardiner, Middletown.
W. E. Wheeler, Stratford.
D. B. Warner & Son, East Haddam.
John S. Welles, Hebron.
Peck Brothers, Northfield.
George W. Miller, Middlefield.
P. W. Bennett, "

OUTSIDE OF CONNECTICUT.

H. J. Baker & Co., New York.
Hobson, Hurtado & Co., New York.
Manhattan Blood Guano Co., "
Charles V. Mapes, New York.
Russell Coe, Linden, New Jersey.
W. H. Bowker & Co., Boston, Mass.
Matfield Fertilizer Co., Boston, Mass.
N. Jackson & Sons, Boston, Mass.
Pacific Guano Co., " "
J. A. Byrnes, Springfield, "

Directions for sending samples of fertilizers will be found in the following, which has been extensively circulated. It is of the utmost importance that in sampling and sending, these directions should be strictly followed.

THE CONNECTICUT AGRICULTURAL EXPERIMENT STATION.

[Circular 1.]

ANALYSIS OF FERTILIZERS.

This Station, established by the last General Assembly, is prepared, in addition to scientific researches of a more abstract character, to execute analyses of fertilizers at the Chemical Laboratory of the Wesleyan University at Middletown.

As the work is paid for in large part from public funds, those analyses which are of public interest will be performed gratuitously. Preference will be given to articles furnished by Farmers' Clubs or Agricultural Societies, and to those whose novelty, importance, or extensive sale give them special interest to the farmers of the State. Where duplicates of the same brand, equally well selected and authenticated, are received, the Director will select from them for analysis at his discretion. The results of analyses will be sent directly to the party furnishing the sample. They will also, where gratuitous, be held at the service of the Station and of the State Board of Agriculture for publication and for general use. For analyses made in the interest of private individuals, the latter will be charged a moderate fee, and will entirely control the results.

It is plainly for the interest of both dealer and consumer, that fertilizers should be bought and sold upon the basis of their actual value, as determined by their composition. To further such a regulation of the trade in commercial fertilizers, arrangements will be made with those dealers who are ready to guarantee the composition of the articles they sell, and wish to place their stock under the supervision of the Station, whereby their wares will be inspected, samples taken for analysis, and results of same reported under the authority of the Director. It is hoped that all will see the advantages of this course, and encourage its adoption, and that every dealer will avail himself of the opportunity thus offered by the Station to secure for himself and his customers the benefit that must accrue therefrom.

The following directions must be *strictly followed* in order to obtain fair samples, and do justice alike to manufacturers, dealers, and consumers.

DIRECTIONS FOR TAKING SAMPLES OF FERTILIZERS FOR ANALYSIS.

FOR GUANOS, SUPERPHOSPHATES, BONE DUST, POTASH SALTS, GYPSUM, &C.

Have ready for holding the sample a *clean*, tight receptacle, preferably a closely capped glass fruit jar, of about one quart capacity. Provide also a large sheet of clean wrapping paper, or a clean newspaper. Weigh carefully three barrels, bags, or packages of the fertilizer, and carefully record the actual weight of each. Open, one after another, each of the three bags, barrels, or packages, that have been weighed. and mix well together the contents down to one-fourth, or better, down to one-half its depth, crushing very finely any lumps that may be found, Then dip out five (5) equal cupfuls (a tea-cup or bowl will answer) from different parts of the mixed portion of each package.* Pour them (15 in all) one over the other on to the paper; intermix these again thoroughly but expeditiously, to avoid loss or gain of moisture; fill the fruit jar or other receptacle from this mixture, close tightly, pack glass fruit jars in a box to prevent breakage, labelled distinctly, and send by express or otherwise, charges prepaid, to "*Agricultural Experiment Station, Middletown, Conn.*"

Each sample must be accompanied by a statement of the weights of the packages, when the article is in packages, the price per ton, &c., also by an exact copy of a specimen of any printed or written *analysis*, *advertisement*, *pamphlet*, or *statement* that accompanies it, or that is used in its sale. Also by a copy of the *brand*, *name*, or *trade-mark*, the name and address of the *dealer* from whom the sample is procured, and of the name and post-office address of the person or persons taking the sample. No sample will be analyzed for public use, unless the name and address of the sender, and other facts are given with sufficient accuracy and definiteness to enable the Station to verify any published statement in regard to the source of the article, &c.

Blanks are prepared for receiving these facts, and those designing to send samples are requested to apply for them at the Station.

W. O. ATWATER, *Director*.

It is of the greatest importance that samples received for analysis should be accompanied by the blank referred to—Blank A—properly filled.

When purchasers desire control analyses, to determine whether the wares they buy are as guaranteed, it is recommended that the samples be taken by the buyer and seller jointly, and forwarded by them with proper specifications, and names of both parties, to the Station. Such Control Analyses will be performed gratuitously so far as public interest and the ability of the Station will warrant. Preference will be given to articles sold under supervision of the Station.

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* In sampling from bags, a butter-tryer, if at hand, may be conveniently used, portions being taken from several different parts of each of several bags.

REMARKS TO TABLE ON PAGES 412–415.

From a large number of commercial fertilizers analyzed at the Station, we select the following as illustrations of the composition and value of these articles, as sold in the State.

There are a few important brands sold in the State of which, had samples been received in season, the analyses would have been given in the present report. In future reports, the attempt will be made to include at least one analysis, and, in many cases, several of each of the leading articles offered for sale in the State.

To the purchaser who may choose to use this as an aid in selecting, it is a matter of minor consequence whether any given article appears here or not. The surety of the value of the article he buys is to be found, not in any one analysis of a sample received at the Station, but rather in the composition of the special lot he buys, as guaranteed by the seller. By comparing the composition of the article as thus guaranteed, with the figures in this table, he may judge whether the valuable ingredients are furnished at fair rates.

Different samples of the same brand of fertilizer often vary considerably in composition. An article of uniform composition may give the best results in one case and fail in another. Hence the reputation of a fertilizer, from the chemical standpoint, is justly based upon the average composition of different samples as actually sold, and from the agricultural standpoint, by its effects when rightly used.

The prices are those given to us by the parties furnishing the samples, and are, unless otherwise stated, cash for lots not less than one ton. While our information as to these prices is believed to be accurate, for the special lots from which the samples were taken, it should be borne in mind that they are subject to variations dependent upon freights, time of payment, amount purchased, etc. The prices stated here are, therefore, in no respect binding for any dealer, or any time or place.

We call especial attention to what has been explained regarding the "Estimated Commercial Values"* of fertilizers, and reiterate that these in no way express *agricultural* values; an article that "analyzes well" may give excellent results in one case, and do very poorly in another. Chemical analysis does not show what will be the effect of a fertilizer under varying conditions of moisture or drouth, warmth or frost, kind of soil, method, application, culture and crop. It does show what plant-food the fertilizer contains, and approximately, at least, what, in itself considered, it is worth. But as was illustrated in the case of the bone-manures on pages 389–392 and elsewhere, it does not always indicate the varying value of the same ingredient, in different forms. Hence the "Estimated Values" are sometimes far from just expressions of the actual values to the user. Since many persons are inclined to judge the article from these figures and from these figures alone, we feel it necessary to refer repeatedly to these facts, and to explain that the figures in the columns under "cost of valuable ingredients per pound," in the table, afford much fairer means of comparing different articles. Were it not for the pressing demand for the "estimated values," sanctioned by long usage, we should be glad to omit that column from the table.

The figures for certain brands given here, will be found to vary somewhat from those of the table in the first edition. This is due to the fact that other samples of the same brand, generally of later manufacture, have since been analyzed, and the results substituted for those of the former edition.

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* See pages 382–384.

List of names of Manufacturers or Importers of Fertilizers of Table on pages 412—415, with names of Dealers by whom they were offered for Sale and of Parties by whom the samples were furnished.

Station Number.	Manufactured or Imported by	Offered for Sale by	Sample Furnished by
3.	H. J. Baker & Brother, New York ,	H. J. Baker & Brother, New York,	Chester Sage,
5.	H. J. Baker & Brother,	H. J. Baker & Brother,	Chester Sage.
6.	Birchall & Chapman, Port Morris, N. Y.,	I. N. Leonard, General Agent,	E. J. Bradley.
8.	Birchall & Chapman, Port Morris, N. Y.,	H. B. Knapp, Sub. Agent,	David Hall.
9.	Manhattan Co., New York,	A. G. & R. A. Pease, Middletown,	Middlefield Farmers' Club.
11.	Geo. W. Miles, Milford, Conn.,	Southmayd & Gardiner, Middletown,	Middlefield Farmers' Club.
15.	Preston & Sons, Greenpoint, L. I.,	Southmayd & Gardiner,	Middlefield Farmers' Club.
16.	Agents for Peruvian Government,	Southmayd & Gardiner,	Middlefield Farmers' Club.
17.	Bridgeport Sulphuric Acid Co.,		Middlefield Farmers' Club.
18.	Thompson & Edwards, Chicago,	Southmayd & Gardiner,	Middlefield Farmers' Club.
19.	Lodi Manufacturing Co.,	Southmayd & Gardiner,	Middlefield Farmers' Club.
24.	G. S. Allyn & Co.,	G. S. Allyn & Co.,	Rev. W. Clift.
25.	Thompson & Edwards,		M. W. Terrill.
28.	Geo. W. Miles,	Geo. W. Miles,	M. W. Terrill.
29.		C. H. Marble & Co., Boston,	J. M. Hubbard.
30.	**Riverside Phosphate Works,**	J. J. H. Gregory, Marblehead, Mass.,	J. M. Hubbard.
31.	**Brighton Abattoir Co.,**	Jacksons & Bowker, Boston,	J. M. Hubbard.
35.		Southmayd & Gardiner,	J. M. Hubbard.
40.	Agents for Peruvian Government,	Geo. E. White, New York,	R. S. Hubbard.
43.	Joseph Lister, Chicago,	Joseph Barry, Middletown,	M. W. Wilcox.
44.	Joseph Lister,	Joseph Barry,	M. W. Wilcox.
45.	Navassa Phosphate Co.,	John Reed, New York,	M. W. Wilcox.
47.	Agents for Peruvian Government,	Southmayd & Gardiner,	M. W. Wilcox.
49.	Kearney Chemical Works, New York,	John Reed, New York,	M. W. Wilcox.
53.	H. J. Baker & Brother,	H. J. Baker & Brother,	H. J. Baker & Brother.
54.	Geo. W. Baker, New York,	Nelson Alvord, Southport,	Rev. E. L. Wells.
55.	Geo. W. Baker,	Nelson Alvord,	Rev. E. L. Wells.
56.	Bridgeport Sulphuric Acid Co.,	T. B. Wakeman,	Rev. E. L. Wells.
57.	Hobson Hurtado & Co., New York,	Hobson, Hurtado & Co.,	W. M. Habirshaw , F. C. S.
58.	Peck Brothers, Northfield,	Peck Brothers,	Mr. Peck.
60.	H. J. Baker & Brother,	H. J. Baker & Brother,	Geo. B Forrester.
61.	H. J. Baker & Brother,	H. J. Baker & Brother,	Geo. B. Forrester.
74.	Quinnipiac Fertilizer Co., New Haven,	Quinnipiac Fertilizer Co.,	H. L. Dudley.
75.	Jas. A. Byrnes, Springfield, Mass.,	Jas. A. Byrnes,	L. F. Mellen.
77.	Jas. A. Byrnes,	Jas. A. Byrnes,	L. F. Mellen.

79.	**G. W. Miles,**	**G. W. Miles,**	**G. W. Miles.**
80.	**G. W. Miles,**	**G. W. Miles,**	**G W. Miles.**
81.			**S. M. Wells.**
91.	J. Lister,		Martin Loveland.
92.	P. W. Bennett, Middlefield,	**P. W. Bennett,**	M. W. Terrill.
93.	Geo. W. Miller & Son, Middlefield,	G. W. Miller & Son,	M. W. Terrill.
94.	H. J. Baker & Brother,	H. J. Baker & Brother,	T. B. Wakeman.
95.	Lister Brothers, Newark, N. J.,	Lister Brothers,	**Rev. E. L. Wells.**
96.	Lister Brothers,	Wm. Meeker & Son,	Rev. E. L. Wells.
97.	Lister Brothers,	Wm. Meeker & Son,	Rev. E. L. Wells.
98.	Lister Brothers,	Horace Staples, Westport,	A. C. Taylor.
99.	Quinnipiac Fertilizer Co., New Haven,	Quinnipiac Fertilizer Co.,	Quinnipiac Fertilizer Co.
100.	Quinnipiac Fertilizer Co,,	Quinnipiac Fertilizer Co.,	Quinnipiac Fertilizer Co.
101.	Quinnipiac Fertilizer Co.,	Quinnipiac Fertilizer Co.,	Quinnipiac Fertilizer Co.
102.	Strong, Barnes, Hart & Co., New Haven,	Strong, Barnes, Hart & Co.,	Strong, Barnes, Hart & Co.
103.	Agents for Peruvian Government,	C. L. Willard, Hartford,	Andrews Brothers.
116.	Pacific Guano Co., Boston,		**Pacific Guano Co.**
117.	E. F. Coe, Williamsburgh, New York,	J. P. Barstow & Co.,	**J, P. Barstow & Co.**
120.	Sternfels Bone Fertilizing Co., New York,	Sternfels Bone Fertilizing Co.,	**Arnold Rudd, New London.**
121.	Lombard & Matthewson, Warrenville, Ct.,	Lombard & Matthewson,	**John D. Gaylord.**
122.	Lombard & Matthewson,	Lombard & Matthewson,	**John D. Gaylord.**
125.	W. H. Bowker & Co., Boston,	W. H. Bowker & Co.,	**Dr. J. W. Alsop.**
126.	R. H. Allen & Co., New York,		**Southmayd & Gardiner.**
127.	E. F. Coe,	**J. P. Barstow & Co.,**	**J. P. Barstow & Co.**
128.	Russell Coe, Linden, N. J.,	**J. P. Barstow & Co.,**	**J. P. Barstow & Co.**
129.	Lister Brothers, Newark, N. J.,	**J. P. Barstow & Co.,**	**J. P. Barstow & Co.**
130.	Thompson & Edwards,	**J. A. Lewis, Willimantic,**	**A. B. Fuller, Columbia.**
131.	Wm. Raynor, Greenpoint, L. I.,	**Mr. Hurlburt, Westfield,**	**Dr. J. W. Alsop.**
132.	J. O. & E. Smith, South Canterbury,		**J. P. Barstow & Co.**
133.	Rumford Chemical Works, Providence, R. I.		**J. P. Barstow & Co.**
139.	Thompson & Edwards,		**F. Ellsworth, Hartford.**

TABLE OF ANALYSES AND VALUATIONS OF COMMERCIAL FERTILIZERS SOLD IN CONNECTICUT.

[We call especial attention to the explanations in the preceding pages, and particularly to what has been said concerning the "estimated commercial values," and reiterate that these latter by no means express, and in some cases differ widely from the *agricultural* values. A more satisfactory method of comparison consists in estimating the actual costs of the valuable ingredients per pound, as in the table, and as explained on pages 385 and 386. The scale of commercial valuations is essentially the same as has been previously in use in the State, and is doubtless rather high for the present condition of the market. The prices per ton, where stated, are as given by the parties furnishing the samples. They are believed to be correct for the places where the individual specimens were obtained, though subject to variations dependent upon freights, time of payment, quantity purchased, etc. No dealer is bound by any price given here. See particularly pages 408 and 409. For names of manufacturers or importers, sellers, and parties furnishing samples, see pages 410, 411.

	ANALYSES.											VALUATIONS.						
				PHOSPHORIC ACID.										COST OF ONE POUND, EACH, OF VALUABLE INGREDIENTS, AT PRICES STATED.				
				Available.											PHOSPHORIC ACID.			
NAME OF FERTILIZER.	Station Number.	Moisture.	Sand, etc.	SOLUBLE.	REVERTED.	INSOLUBLE.	TOTAL.	Bone phosphate of lime equivalent to tot'l phosphoric acid	POTASH.	NITROGEN.	Ammonia equivalent to Nitrogen.	Retail price per ton.	Estimated Commercial Value.	NITROGEN.	SOLUBLE.	REVERTED.	INSOLUBLE.	POTASH.
PHOSPHATIC FERTILIZERS.																		
WITHOUT NITROGEN.																		
English Superphosphate,	5	17.39	6.12	10.27	.....	3.50	13.77	30.06	.....	.....	.....	* $33.00	$35.01	.....	14.1	.....	5.6	.....
Navassa Phosphate,	45	1.41	3.65	.....	.....	.....	20.45	44.64	.....	.....	.....	.....	16.36	.....	.....	.....	.....	.....
English Superphosphate,	53	8.55	....	23.28	.....	8.67	31.95	68.85	.....	.....	.....	61.00	80.24	.....	11.5	.....	4.6	.....
" "	60	16.36	....	12.19	1.31	0.70	14.20	31.00	.....	.....	.....	.....	40.03	.....	.....	.....	.....	.....
" "	61	13.03	....	17.79	.....	1.04	18.83	41.10	.....	.....	.....	.....	54.41	.....	.....	.....	.....	.....
Caribbean Sea Guano,	125	11.90	0.51	.....	.....	.....	27.18	59.38	.....	.....	.....	.....	21.74	.....	.....	.....	.....	.....
WITH NITROGEN.																		
Bone Manures.																		
Ground Bone, J. Lister,	43	5.69	2.81	.....	.....	.....	23.55	51.41	.....	3.15	3.82	* $42.00	40.86	20.6	.....	.....	6.2	.....
Fine Bone, G. W. Baker,	54	16.78	3.40	.....	.....	.....	14.41	31.46	.....	2.46	2.99	.....	27.13	.....	.....	.....	.....	.....
Coarse Bone, " "	55	19.66	2.38	.....	.....	.....	15.53	33.90	.....	3.04	3.69	.....	30.80	.....	.....	.....	.....	.....
Ground Bone, Peck Bros.,	58	11.88	...	.....	.....	.....	19.79	43.20	.....	4.03	4.89	38.00	39.87	19.	.....	.....	5.7	.....
Pure Ground Bone, J. A. Byrnes,	75	7.07	....	.....	.....	.....	19.68	42.96	.....	3.79	4.60	.....	38.77	.....	.....	.....	.....	.....

Steamed Meat and Bone, J. A. Byrnes,	77	9.66	....	.....	.....	.....	21.22	46.32	......	3.38	4.11	....	38.98	....	......	....	....	....
"Pure Bone,"	81	7.54	....	.....	.....	.....	15.22	33.22	......	5.46	6.62	....	40.10	....	......	....	....	....
Ground Bone, J. Lister,	91	4.24	....	.....	.....	.....	22.85	49.88	......	3.63	4.40	....	41.94	....	......	....	....	....
Ground Bone, P. W. Bennett,	92	7.98	....	.....	.....	.....	22.05	48.13	......	3.91	4.74	....	42.10	....	......	....	....	....
Ground Bone, G. W. Miller,	93	7.87	....	.....	.....	.....	21.95	47.92	......	3.88	4.71	....	41.87	....	......	....	....	....
Ground Bone, H. J. Baker & Bro.,	94	7.00	....	.....	.....	.....	23.61	51.54	......	3.88	4.71	33.00	43.85	15.0	......	....	4.5	....
Bone Flour, Lister Bros.,	96	16.05	....	.....	.....	.....	14.62	31.92	......	2.36	2.86	35.00	26.98	26.0	......	....	7.8	.....
Bone Meal, Lister Bros.,	97	18.45	....	.....	.....	.....	14.25	31.10	......	2.37	2.87	30.00	26.58	22.6	......	....	6.8	....
Celebrated Ground Bone, Lister Bros.,	98	17.09	....	.....	.....	.....	10.70	23.36	......	3.43	4.16	31.00	26.56	23.3	......	....	7.0	....
Raw Ground Bone, Thompson & Edwards,	106	8.78	5.56	.....	.....	.....	15.26	33.81	......	3.90	4.73	47.50	33.91	28.0	......	....	8.4	....
"Dissolved Bone," Thompson & Edwards,	107	12.37	....	.....	.....	.....	12.38	27.02	......	3.99	4.84		30.81	....	......	....	....	....
Fine Bone, Lombard & Matthewson,	121	8.23	....	.....	.....	.....	26.72	58.33	......	3.40	4.12	45.00	45.66	19.7	......	....	5.9	....
Ground Bone, R. H. Allen & Co.,	126	10.12	6.45	.....	.....	.....	22.94	50.07	......	3.57	4.33	....	41.81	....	......	....	....	....
Ground Bone, Lister Bros.,	129	14.71	3.74	.....	.....	.....	12.98	28.33	......	2.84	3.44	38.00	26.94	28.1	......	....	8.5	....
Raw Ground Bone, Thompson & Edwards,	130	12.03	0.89	.....	.....	.....	22.67	49.50	......	2.63	3.19	* 40.00	37.73	21.2	......	....	6.4	....
NITROGENOUS PHOSPHATES AND SUPERPHOSPHATES.																		
Phosphatic Blood Guano, Manhattan Co.,	9	21.83	0.93	7.83	1.75	2.08	11.66	25.45	1.20	2.90	3.52	....	45.90	....	......	....	....	....
Ammoniated Superphosphate, G. W. Miles,	11	19.37	2.60	9.91	0.16	0.80	10.87	23.69	......	2.75	3.38	* 48.00	44.76	26.8	16.0	10.7	6.4	... ...
Superphosphate, Preston & Sons,	15	21.75	3.60	9.94	.....	4.10	14.04	30.65	......	1.67	1.96	* 42.50	43.12	23.8	14.8	......	5.9	....
Steamed Bone, "Dissolved," Thompson & Edwards,	25	8.71	....	0.43	.....	12.34	12.77	27.88	......	4.25	5.15	* 48.00	37.35	32.2	19.3	......	7.7	....
Ammoniated Bone Phosphate, Thompson & Edwards,	26	14.84	....	0.95	.....	12.83	13.78	30.08	......	4.16	5.05	* 48.00	39.04	30.8	18.5	....	7.4	....
Riverside Phosphate, J. J. H. Gregory,	30	20.16	....	.....	.....	.....	20.44	44.62	......	4.18	5.07	* 45.00	45.43	24.8	......	....	5.9	....
Animal Fertilizer, Acidulated, Brighton Abattoir,	31	17.59	...	6.37	.....	1.11	7.48	16.32	1.73	5.33	6.47	....	47.65	....	......	....	....	....
Superphosphate, Bridgeport Sulphuric Acid Co.,	56	9.37	8.41	3.67	.....	7.43	11.10	24.23	......	1.14	1.38	....	25.62	....	......	....	....	....
Ammoniated Bone Superphosphate, G. W. Miles,	79	24.15	3.40	9.28	2.61	0.91	12.84	28.03	......	2.57	3.12	45.00	47.00	23.7	14.2	9.5	5.7	....
Superphosphate, Lister Bros.,	95	19.09	....	10.29	2.12	1.38	13.79	30.10	......	2.60	3.21	45.00	49.99	22.5	13¼	9.	5½	....
Soluble Nitrogenous Phosphate, Quinnipiac,	101	19.27	....	7.24	.....	0.46	7.71	16.81	......	4.41	5.36	40.00	44.34	22.7	13.6	....	5.4	....
Soluble Pacific Guano,	116	10.29	....	5.06	1.50	7.23	13.79	30.10	4.62	2.42	2.93	....	6	....	......	....	....	....
Ammoniated Superphosphate, E. F. Coe,	117	19.16	1.25	10.22	2.80	1.66	14.68	32.04	......	2.54	3.08	42.00	50.95	21.	12.5	8.4	5.1	....
Ammoniated Dissolved Bone, Sternfel's	120	16.83	5.83	2.64	2.30	0.44	5.39	11.76	......	2.09	2.53	40.00	23.49	42.5	25.5	17.0	10.2	....

TABLE OF ANALYSES AND VALUATIONS OF COMMERCIAL FERTILIZERS SOLD IN CONNECTICUT—CONTINUED.

	ANALYSES.											VALUATIONS.						
NAME OF FERTILIZER.	Station Number.	Moisture.	Sand, etc.	PHOSPHORIC ACID.				Bone phosphate of lime equivalent to tot'l phosphoric acid	POTASH.	NITROGEN.	Ammonia equivalent to Nitrogen.	Retail price per ton.	Estimated commercial value.	COST OF ONE POUND, EACH, OF VALUABLE INGREDIEFTS, AT PRICES STATED.				
				Available.											PHOSPHORIC ACID.			
				SOLUBLE.	REVERTED.	INSOLUBLE.	TOTAL.							NITROGEN.	SOLUBLE.	REVERTED.	INSOLUBLE.	POTASH.
Superphosphate, Lombard & Matthewson,..............................	122	4.29	4.78	5.75	6.38	2.89	15.02	32.79	......	2.92	3.54	$50.00	$48.08	25.9	15.6	10.4	6.2	....
Abattoir Guano, E. F. Coe,............	127	17.61	.....	8.91	1.69	1.23	11.83	25.82	3.99	3.39	4.11	50.00	54.92	22.7	13.6	9.1	5.5	7.3
Ammoniated Bone Phosphate of Lime, Russell Coe,......................	128	21.01	.....	11.67	0.92	0.20	12.79	27.82	......	2.24	2.71	40.00	48.29	21.0	12.5	8.3	5.0	....
Superphosphate, Wilson's,............	133	19.70	2.62	5.84	1.19	1.04	8.07	17.61	......	2.39	2.90	40.00	33.09	30.0	18.0	12.0	7.2	....
Ammoniated Bone Superphosphate, Thompson & Edwards,............	139	19.31	2.27	1.70	8.60	3.22	13.53	29.53	......	2.39	3.62	50.00	41.11	30.4	18.2	12.1	7.3	....
NITROGENOUS FERTILIZERS.																		
WITH CONSIDERABLE PHOSPHORIC ACID. *Peruvian Guanos.*																		
Guanape,..............	16	16.60	.....	5.75	.....	11.69	17.44	38.07	......	9.37	11.37	* 70.00	78.12	21.7	13.0	....	5.2	....
Guanape,..........	40	20.66	0.47	9.18	.....	8.15	17.33	37.83	1.20	7.35	8.92	* 60.00	75.99	19.6	11.7	....	4.7	6.3
Guanape,............................. ..	47	11.40	2.10	.....	.....	.....	15.37	33.55	......	11.33	13.75	60.00	72.89	20.0	......	....	4.8	....
Rectified Peruvian,..........	57	12.61	.....	10.67	.....	1.62	12.59	27.48	2.43	9.15	11.10	60.00	83.58	17.9	10.7	....	4.3	5.7
No. 1. Peruvian (Guanape),..	108	21.57	.....	.....	.....	.....	17.90	39.07	......	8.56	10.39	....	64.28	....	......	....	....	... ...
WITH LITTLE OR NO PHOSPHORIC ACID. *Fish Manures.*																		
Allyn's Fertilizer,.....................	24	......	.....	.....	.....	.....	6.17	13.48	......	8.80	10.68	....	51.42	....	......	....	....	....
Fish Guano, G. W. Miles,.............	28	21.96	.....	.....	.....	.....	8.66	18.90	......	6.07	7.37	* 40.00	40.74	24.5	......	....	5.8	....
C. Island Guano, G. W. Miles,.........	80	8.63	1.43	.....	.....	.....	7.74	16.90	......	8.84	10.73	....	43.48	....	......	....	....	....
Pine Island Guano, Quinnipiac,.......	99	15.93	.....	4.95	2.32	1.93	9.20	20.11	......	5.64	6.84	45.00	50.03	22.5	13.5	9.0	5.4	....
Dry Ground Fish Guano, Quinnipiac,.	100	14.64	.....	.....	.....	.....	6.67	14.59	......	7.50	9.11	45.00	45.50	24.6	......	....	5.9	....
Fish Scrap,.........................	103	40.95	.....	.....	.....	.....	6.23	13.60	......	5.33	6.47	5 16.00	28.79	11.1	......	....	3.3	....

Fish Scrap,..................	181	25.10	2.42	.....	.....	.....	7.49	16.35	.....	5.49	6.66	* 16.00	30.93	10.3	......	....	3.1	....
Animal Refuse. Not Superphosphated.																		
Animal Dust,........	29	14.45	.....	0.26	.....	5.80	6.06	13.22	......	7.32	8.89	[2] 50.00	44.34	28.2	16.9	....	6.7	....
Azotin,........	49	12.56	.....	.....	.....	.....	6.92	15.10	......	7.33	8.89	50.00	44.95	27.7	......	....	6.6	....
Dried Blood, Meat Scrap and Bone. Strong, Barnes, Hart & Co.,.......	102	12.26	.....	.....	.....	.....	5.20	11.35	......	8.08	9.80	40.00	46.64	21.6	......	....	5.1	....
Azotin,...............................	118	......	.....	.....	.....	.....	......	......	......	11.71	14.21	....	58.55	....	......	....	....	....
Dried Blood,........	119	......	.....	.. .	.....	.....		......	......	10.87	13.19	....	54.35	....	......	....	....	....
Sulphate of Ammonia,................	8	......	.....	.....	.....	.....	......	......	......	20.53	24.92	* 97.50	102.60	23.7	......	....	....	....
Castor Pomace,........................	85	6.83	.....	... .	.....	.....	2.11	4.60	......	4.80	5.83	40.00	26.53	37.7	......	....	9.05	....
Castor Pomace,........................	59	7.21	1.36	.....	.....	.....	1.91	4.16	......	4.72	5.73	....	25.89	....	......	....	....	....
Castor Pomace,........................	105	19.13	0.88	.....	.....	.....	2.42	5.31	......	5.29	6.42	....	29.35	....	......	....	....	....
MISCELLANEOUS.																		
American Bone Fertilizer,............	6	10.10	47.15	.....	.....	.....	2.61	5.71	... ..	1.02	1.23	* 55.00	8.23	167.1	......	....	40.1	....
American Bone Fertilizer,.......	8	13.07	41.46	.....	.....	.....	2.80	6.11	......	1.03	1.24	* 55.00	8.48	158.8	......	....	38.1	....
Lodi Double Refined Poudrette,.......	19	4.20	63.07	.....	.....	.....	2.22	4.84	......	1.41	1.71	25.00	9.71	64.4	......	....	15.4	....
HOME-MADE SUPERPHOSPHATES.																		
Made by adding Sulphuric Acid to Ground Bone, No. 43,............	44	1.39	.....	1.27	.....	17.73	19.00	41.47	......	2.70	3.27	[4] 42.00	38.59	27.2	16.3	....	6.5	....
Made by adding Sulphuric Acid to Navassa Phosphate, No. 45,........	46	15.85	.....	7.96	.....	11.56	19.52	42.61	......	.....	.....	[4] 28.00	37.75	....	11.1	....	4.4	....
Made by adding Sulphuric Acid to Guanape Guano, No. 47,..........	48	16.01	.....	9.05	.....	3.77	12.82	27.98	......	7.69	9.33	[4] 57.40	70.12	20.4	12.2	....	4.9	....

* Price in 1875, when sample was taken. † See pages 389–392 for remarks on bone manures. The fine steamed bone is worth relatively more, and the coarse raw bone relatively less than the estimated commercial values indicate. [1] (No. 43) in car-load lots. (?) [2] (Nos. 29 and 31) two dollars and fifty cents per cwt. No. 29 probably less, and 31 probably $40, by the ton. [3] (No. 130) in car-load lots. [4] Nos. 44–46–48, superphosphated by purchasers. No. 46 was too moist for convenient use; 48, rather lumpy. The cost of materials, but not of labor, was taken into account. [5] No. 103. Assumed price, see page 393. [6] (No. 116). At 6 cents per lb. for insoluble Phosphoric Acid, the calculated value of this fertilizer would be $46.35. At 4 cents for insoluble phosphoric acid (which is probably a more just valuation for fossil and mineral phosphates), it would be $43.45. See page 383.

The figures for certain brands given here, will be found to vary somewhat from those of the table in the first edition. This is due to the fact that other samples of the same brand, generally of later manufacture, have since been analyzed, and the results substituted for those of the former edition.

☞The figures of this table, taken alone, without study of the preceding text, give a very inadequate idea of the articles.

REPORT OF THE TREASURER.

NATHAN HART, IN ACCOUNT WITH
THE STATE BOARD OF AGRICULTURE.

May 27, 1875,	Balance in Treasury, - - -		$ 200.16
Jan. 3, 1876,	Cash from State Treasurer, - -		2,500.00.
			$2,700.16

PAID.

May 27, 1875,	P. M. Augur, - - - - -		$100.00
" "	Wm. H. Pond, - - - - -		6.50
June 1, "	N. Cressy, - - - - -		34.81
Oct. 21, "	Case, Lockwood & Brainard, - -		35.65
Dec. 1, "	" " " - -		28.92
Dec. 17, "	John T. Rockwell, - - -		6.77
" "	S. M. Wells, - - - - -		10.25
Jan. 5, 1876,	J. M. Hubbard, - - - - -		23.85
" "	G. A. Penniman, - - - - -		62.55
" "	S. F. West, - - - - -		29.00
" "	P. M. Augur, - - - - -		84.96
" "	Albert Day, - - - - -		54.75
" "	E. H. Hyde, - - - - -		113.69
" "	A. L. Avery, - - - - -		28.75
" "	H. L. Stewart, - - - - -		28.70
" "	T. S. Gold, Salary, -	$700.00	
	Traveling expenses,	123.71	
	Express and Freight,	36.76	
	Telegrams, -	1.54	
	Postage, -	38.83	
	Stationery, -	3.57	
	Expense of Farm Com.,	5.00	
	Bill of Printing,	27.00	
			$936.41
March 22,	J. M. W. Yerrington, - - -		144.50
May 15,	T. S. Gold, expenses at Winter meeting, - -	$174.50	
	Traveling expenses,	119.81	
	Postage and Telegrams,	24.90	
	Express, - - -	10.20	
	Printing, Winsted Herald,	3.66	
			$333.07
May 24,	Nathan Hart, - - - - - -		60.00
"	Cash in Treasury, - - - - -		577.03
			$2,700.16

NATHAN HART, *Treasurer.*

WEST CORNWALL, May 24, 1876.

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